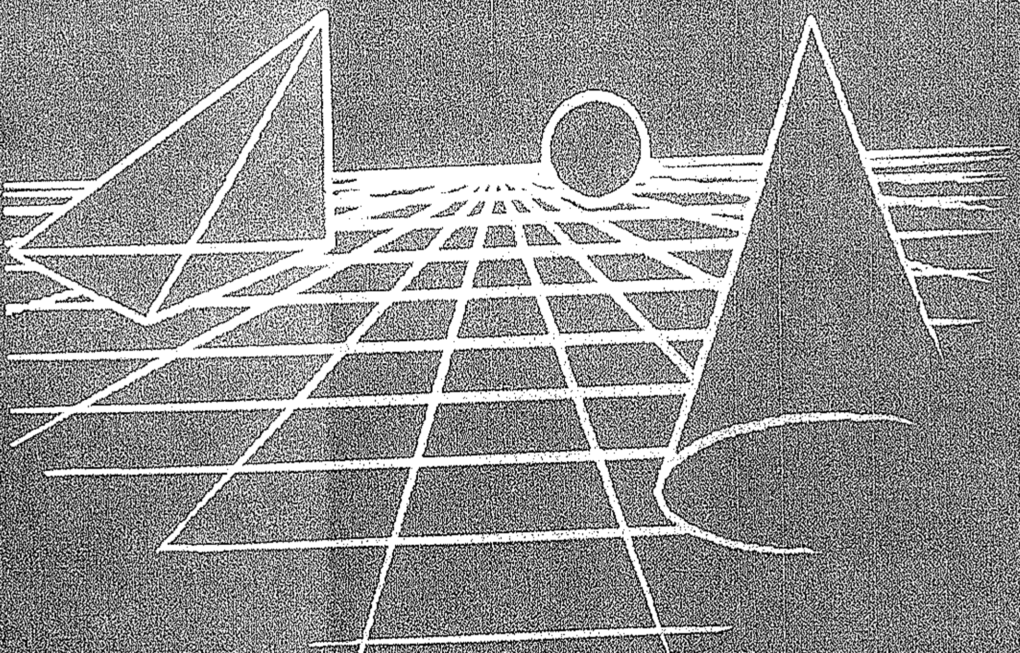


Making Instructional Design Decisions

Second Edition

Barbara Seels
Zita Glasgow

Chapter 7

Using Models and Paradigms

OVERVIEW

ISD models serve as analogs for the process used to complete any design project. These visual or verbal representations of the ISD process are used to guide design in many settings (e.g., business or schools) and for many purposes (e.g., education in developing countries or training pilots). Each model emphasizes different aspects of the process. Comparable ISD models are the Instructional Development Institute (IDI) Model (1973), the Air Force Model (1975), the Gagné, Briggs, and Wager Model (1992), the Smith and Ragan Model (1993), the Kemp, Morrison, and Ross Model (1994), the R2D2 Model (1995), the Reiser and Dick Model (1996), the Dick and Carey model (1996), and the Seels & Glasgow Model (1997) used in this textbook.

The IDI Model has three phases: define, develop, and evaluate. The Air Force Model is iterative in nature; the steps are repeated and revisions are made as new information is revealed at a later step. The Gagné, Briggs, and Wager Model uses Gagné's theories about types and conditions of learning as a basis for analysis and design decisions. Smith and Ragan's model is divided into three stages: analysis, strategy, and evaluation. Kemp, Morrison, and Ross's model is very flexible. The order of steps can be modified to suit the situation. The R2D2 Model is described as a recursive, reflective design and development model consistent with the constructivist paradigms discussed at the end of this chapter. Reiser and Dick's model is appropriate for novices. Dick and Carey's model emphasizes the instructional analysis step.

Like the other models, the Seels & Glasgow ISD Model II: For Practitioners is a variation of its predecessors. It separates project management into three phases and presents diffusion as an ongoing process. The model is iterative because the products of the steps can be revised as the process proceeds. Thus, the design is continually being refined and polished by returning to a step and making adjustments. For example, you can complete a task analysis before writing objectives; however, you can also expand the task analysis and rewrite the objectives as new insights are revealed. When an instructional design process is used to solve problems, decisions must be made about which model to use and what adjustments, if any, need to be made in the model chosen. A design team may choose to develop their own model instead.

When a management plan is developed, an ISD model must be chosen to guide the process. An existing model can be adopted or adapted, or a model may be created just for the project. In either event, this step needs to be done early on so that it can provide structure for a project team.

The decision to use an ISD model may depend to some extent on the adoption of learning paradigms such as behaviorism, cognitive science, and constructivism. This is because paradigms have different positions on the use of objectives and strategies for instruction and evaluation. These positions make some ISD models more appropriate than others. In the case of constructivism, there is debate about whether ISD models can be used at all.

Orienting Questions

What is an ISD model?
What purposes can these models serve?
What are the similarities and differences among major ID models?
What are the components of Seels & Glasgow ISD Model II: For Practitioners?
What are learning paradigms, and how do they relate to instructional design?

Objectives

1. Given authors' ISD models, you will be able to match a schematic or descriptive phrase with each author.
2. Given an essay question, you will be able to explain the steps and flow of the Seels & Glasgow ISD Model II: For Practitioners.
3. Given a chart, you will be able to compare and contrast ISD models using date, configuration, and unique characteristics and infer reasons for the variations.
4. Given true/false statements, you will be able to distinguish between behavioral, cognitive science, and constructivist learning psychologies.
5. Given a chart, you will be able to visualize how design elements for the same instructional problem would change based on different paradigms for learning.

FUNCTIONS OF MODELS

Models can take many forms: verbal, visual, or three-dimensional. Whatever form they take, their purpose is to present a view of reality. They are used to give form and substance to conceptual relationships or procedures. Although models represent a reality, they can never be a complete representation, because you must abstract in order to translate reality into theoretical terms. Models can show variables and their interrelationship or they can represent steps in a problem-solving process.

Instructional design models give visual form to the procedures used in the ISD process. Often this is done with an accompanying description in verbal form. An ISD model is modified as it is implemented in different settings and situations.

Imagine you've finished your studies and accepted a position as instructional designer. You are assigned your first project, which is a relatively ambiguous task, such as improving the instruction in a course or changing the behaviors of employees who do performance appraisals. How do you control your anxiety? You break the task into parts. The first part is to decide on procedures you will follow in solving this problem.

The instructional systems design model is a representation of the process you or your team agrees to follow when doing instructional design. ISD models serve several purposes:

1. They visualize a systematic process, thus allowing those involved to reach consensus on that process.
2. They provide a tool for managing the process and project.

3. They allow you to test theories by integrating them within a practical model that can be applied.
4. They set tasks for the designer that can be used as criteria for good design.

Instructional design models are based on assumptions about tasks and the order of tasks. Always question these assumptions. Like all models, the ISD model is not reality; rather, it is a way to simplify and make reality visible. There are more aspects to each step than known in the model. Each step breaks down to many substeps.

Usually ISD models are adaptations of the generic model. This is because a model must be modified to fit specific situations or localities. What is new in the model is not the process, but rather the interpretation of the process.

ISD models differ in many ways. Some are accompanied by annotations or descriptions of how to implement a step. Others include only brief descriptions of a step. Most require doing each step in a prescribed order; a few allow more flexibility. Some are linear and others are iterative. The order of steps and what steps are included differs from model to model.

COMPONENTS OF MODELS

Models are constructed by showing the relationship among the steps and how the steps occur chronologically. A step is a task or phase that must be completed in order to develop an instructional design solution.

The generic model represented in chapter 1 consists of five steps: analysis, design, development, implementation, and evaluation. These steps are simply listed or shown in a line of five rectangular blocks connected by arrows. This model defines the process as five steps in fixed order performed one at a time. Other models may vary the steps, show more steps, or suggest more flexibility.

Andrews and Goodson (1980) compared 30 ISD models on the basis of 18 dimensions, including problem identification, alternative solutions to instruction, identification of constraints, and cost of instructional programs. They cautioned that many of the models represent a series of mechanical or linear steps rather than the complex analytical and cybernetic process required in order to apply the systems approach effectively.

Richey (1986) examined Andrews and Goodson's "Comparative Analysis of Models of Instructional Design." Their list of common elements was reduced to the six core elements shown in Table 7.1.

The question of whether ISD models are or should be linear is an interesting one. The word "linear" means arranged in a line or taking the form of a line. In programmed instruction, linear style means each learner follows the same path or line. Using this meaning, some of the models to be discussed, such as the IDI Model, are linear; others, such as the Air Force Model and the Kemp, Morrison, and Ross Model, are not.

The issue is whether an ISD model when applied should require a fixed sequence of steps, or whether there should be some flexibility. The flexibility in the Air Force and Kemp, Morrison, and Ross Models serves different purposes. Kemp, Morrison, and Ross's model uses flexibility to adapt to situations; the Air Force Model uses it to adapt to information resulting from a previous step. The Air Force Model still requires a prescribed sequence of steps. The consensus of ISD models is that there is a fixed order of steps to be followed, and that the process is iterative.

Several ISD models provide for flexibility in the order of steps by being iterative or by leaving options. Some of the ISD models that provide for simultaneous and interacting steps as well as linear ones are the Air Force; Kemp, Morrison, and Ross; Dick and Carey; and Seels and Glasgow models.

In his review of ISD models, Gustafson (1991) compares models on several dimensions. The first dimension is purpose. He describes some models as oriented towards

Table 7.1 A Definition of the Six Core Elements

Core Elements	*Andrews/Goodson Tasks*
Determine learner needs	Assessment of needs, problems identification, occupational analysis, competence or training requirements
	Characterization of learner population
Determine goals and objectives	Formulation of broad goals and detailed subgoals stated in observable terms
	Analysis of goals and subgoals for types of skills/learning required
	Sequencing of goals and subgoals to facilitate learning
Construct assessment procedures	Development of pre-test and post-test matching goals and subgoals
Design/select delivery approaches	Formulation of instructional strategy to match subject-matter and learner requirements
	Selection of media to implement strategies
	Development of courseware based on strategies
	Consideration of alternative solutions to instruction
Try out instructional system	Empirical tryout of courseware with learner population, diagnosis of learning and courseware failures, and revision of courseware based on diagnosis
Install and maintain system	Formulation of system and environmental descriptions and identification of constraints
	Development of materials and procedures for installing, maintaining, and periodically repairing the instructional program
	Costing instructional program

From *Theoretical and Conceptual Bases of Instructional Design* by R. Richey, 1986, New York: Nicols Publishing.

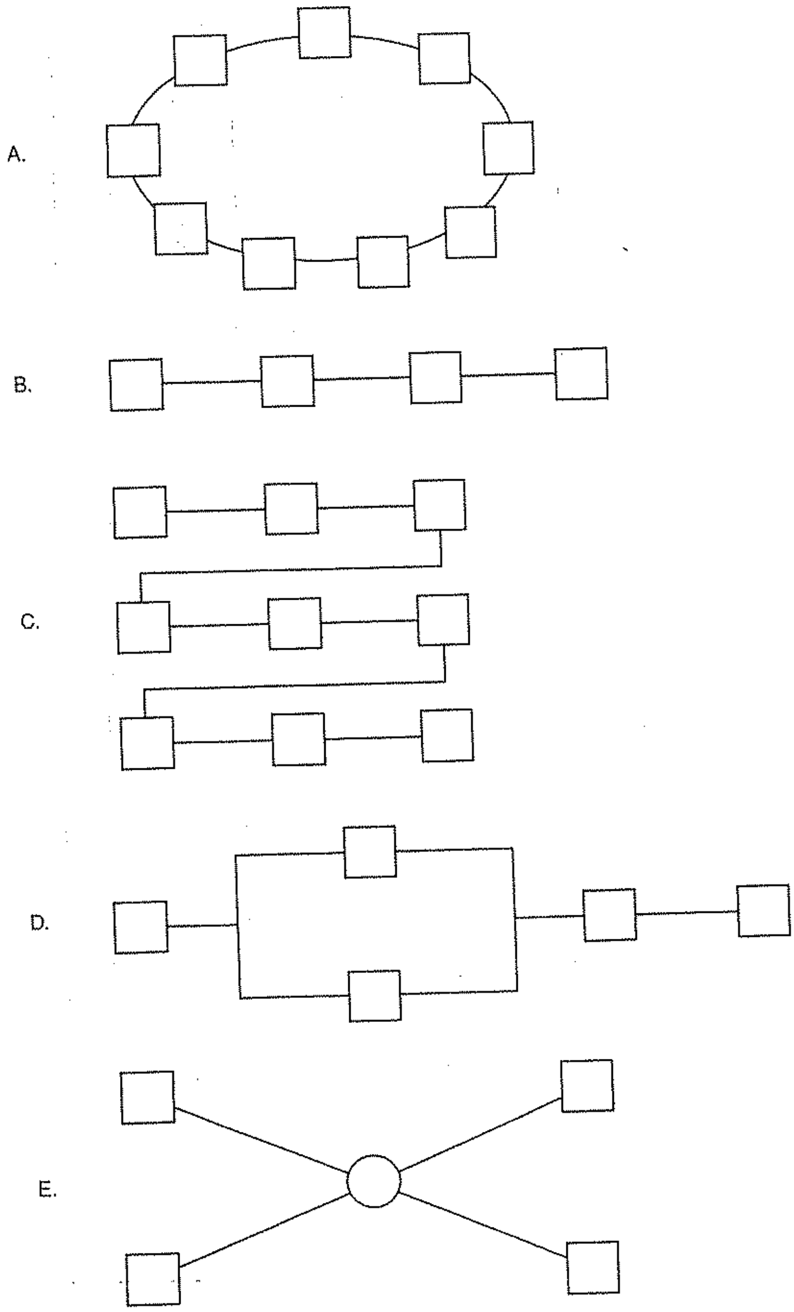
classroom instruction, others towards product development, and others towards course development. Depending on their orientation, the models require different resources. For example, classroom instruction development is done individually with few resources, little needs analysis, and tryout and revision. The results are not disseminated. Product and course orientations, on the other hand, generally require team development using extensive resources, with some needs analysis and extensive tryout and revision. The results are widely disseminated.

VISUAL DIFFERENCES

One of the reasons for using visual models is that you can see at a glance the nature of the process. Differences between processes are shown through shapes and connections between shapes. There are two aspects of the ISD process that can be interpreted through shapes. One is the sub-processes used to reach the goal, such as operations (rectangles) or decision-making (diamonds). The other is the overall configuration of all the shapes together. What basic shape does the whole process take? If you can answer this question, you've learned something about the process from the model.

Figure 7.1 presents five shapes that are common to ISD models.

Figure 7.1 Different Configurations of Models



Shape A is an oval. It could also be drawn as a circle. This shape suggests no beginning and no end. The operations are connected so that wherever you start you complete all the steps. (This is not to be confused with the ovals used to begin and end a flowchart.)

Shape B is basically a short line of steps. It is a simple path to follow. Shape C is more complex. The basic shape is a large rectangle made from a path that allows for many steps in a line that starts at the top left corner and loops like a maze to the bottom right corner. More steps can be represented in a single path using this shape.

Shape D is a variation on B. You follow one path, but at points along that path you deal with two steps alternately or simultaneously. This path can be long or short and the number of concurrent steps can vary.

Shape E is a cross. The circle in the center is an intersection through which information passes. In this model, the steps are done in a specified order, but a step can be returned to at any point. The crucial element is the cross point, where information from each step is checked against information from another step and a decision is made to return to a step or proceed.

The basic shapes—oval or round, line, rectangle, cross, and line with squares projecting above and below—are some of the configurations ISD models can take. The oval indicates a flexible starting point; the line, a predetermined path; the rectangle, a long series of steps in a predetermined path; and the cross, steps that are returned to as information from other steps is checked. There are other configurations, but these examples show how the configuration of a model can reveal differences among ISD processes.

COMMON ERRORS

A designer should be aware of errors that occur commonly in the use of models. Boutwell (1979) lists several:

- Social variables are not taken into account.
- Training is generalized when it is situational.
- Other solution strategies are often ignored.
- Courses and materials are evaluated as single entities, rather than as interacting components of a larger whole.
- Models are often blindly adopted, rather than creatively adapted.

One common problem with the use of an ISD model is the use of an essentially structural model as if it were the complete procedure or paradigm. Because models are static and simplified, they lack the detail and dynamic interaction that must be provided in the ISD process. Designers should be aware of this and adjust accordingly. For example, some models lack a problem analysis phase and start with the assumption that an instructional problem exists. Yet for non-academic settings, the problem analysis phase is often necessary and important.

Therefore, when you adapt a model for the process you'll use to design instruction, don't do it blindly. Understand the assumptions of the model such as fixed path or starting point and why you chose it. Be aware, also, of the limitations of a model such as too few steps. In addition to the problems already mentioned, there can be errors in implementation such as not faithfully executing the steps, implementing the steps superficially, and rushing to completion due to unrealistic timelines (Hannum, 1983). In each of these cases, if you report that the model was used for your problem-solving process, you are not being accurate, because the process was not followed completely. In addition to applying a model completely, remember to question the appropriateness of the model. Remember also that the model does not represent the process exactly as it occurs in reality.

SELECTED ISD MODELS

The following is just a sampling of the models that have been published over the last 40 years.

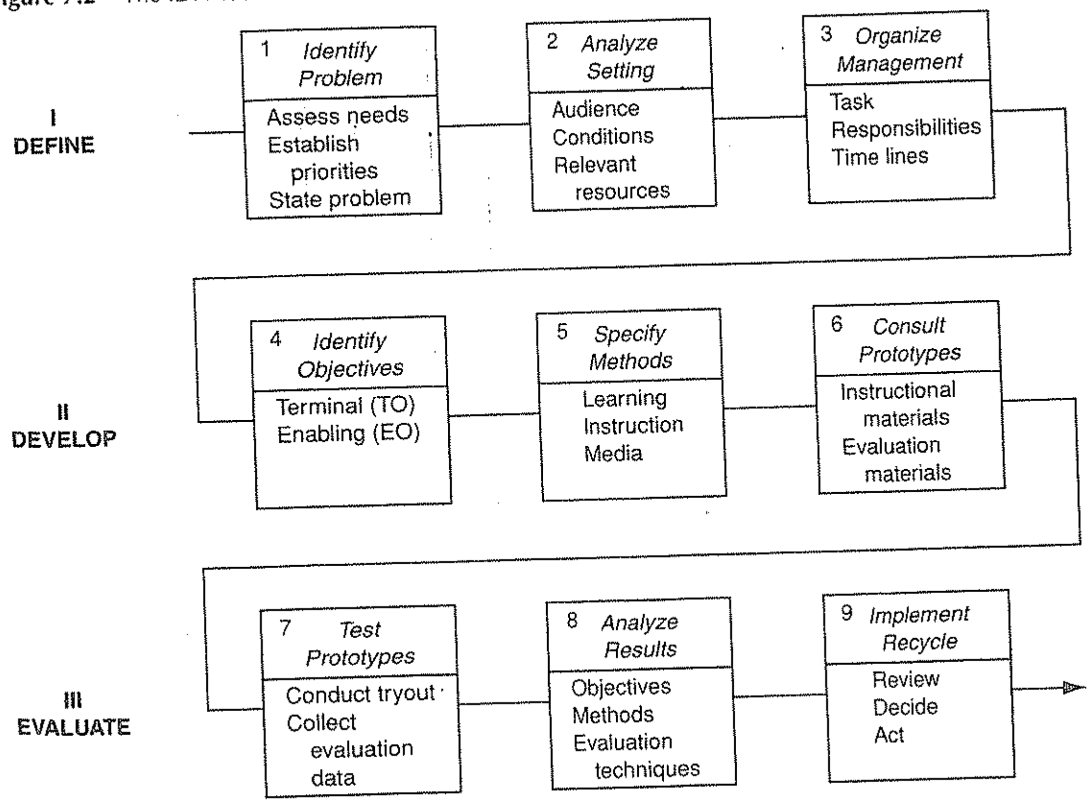
The IDI Model (1973)

In 1965 a consortium was formed by instructional technology departments at the University of Southern California, Syracuse University, Michigan State University, and the U.S. International University in Corvallis, Oregon. In 1973–74 the consortium changed its name to the University Consortium for Instructional Development & Technology (UCIDT), and Indiana University became a member (Wittich & Schuller, 1973).

The U.S. Office of Education gave the consortium a grant to create IDIs for public school personnel. In the early 1970s the IDIs were used to train teams of administrators, teachers, and curriculum and media specialists in principles of instructional systems design. After a thorough review of the literature on systems approaches and design, the institute materials were developed by institutional members of the consortium (UCIDT, 1968). About 400 Instructional Development Institutes were conducted in 20 states. The subsequent evaluation was not thorough enough to determine impact. However, since then the components of the IDI workshops have been modified and used nationally and internationally with much success (Schuller, 1986).

The IDI model is noteworthy for its "organize management" step, which is missing from other models. This model also has the strength of being very detailed. The IDI project has nine steps in three stages called decision points in instructional development. Explanatory detail accompanies each step. Figure 7.2 shows the IDI model.

Figure 7.2 The IDI Model



The Air Force Model (1975)

The U.S. Air Force has been a pioneer in the application of instructional systems design concepts. It was the military that emphasized a systematic procedure for assuring application of instructional technology to course planning and development. The Air Force was among the first organizations to use a systematic approach to ISD. Today, the Air Force annually trains thousands from its ranks as instructional designers. Manuals for training instructors in ISD concepts were published from 1975.

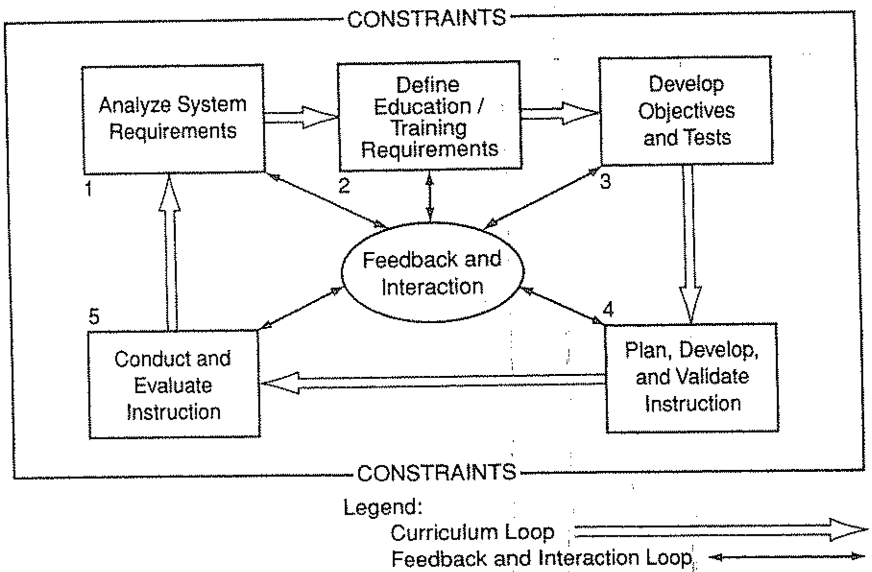
Because training using the ISD approach is so important, Air Force policy states that ISD should be used to produce all training materials. The process requires the following:

1. determining job performance requirements;
2. determining training requirements (what is necessary to bring them to a skill level);
3. writing behavioral objectives and test items;
4. designing instructional procedures and materials; and
5. conducting and evaluating the instruction.

There is interaction between steps of the model, so sometimes portions of several steps can be revised simultaneously. The output of one step is intended to provide the information needed to accomplish a later step.

The Air Force Model is accompanied by adequate detail. Generally it is used by a team, although sometimes one person uses the model to perform the ISD process. This model emphasizes a thorough systems analysis before moving to the design phase. A lengthy process of collecting information about the learners, instructors, environment, subsystems, purposes, and policies is conducted, and task analysis is done thoroughly. The problem is examined until it is proved to be an instructional problem. After the first phase, decisions in other phases are based on the conclusions reached during the analysis stage. Classroom management techniques and individual differences are stressed at the "plan instruction" stage. The "conduct and evaluate" instruction stage includes support functions such as instructor training and facilities maintenance. Evaluation is conducted in both the field and the learning environment. This military model emphasizes analysis of content requirements and stresses instructional and systems management. The five-step model used by the Air Force is shown in Figure 7.3.

Figure 7.3 Air Force Model



From *Instructional System Development* (UAF Manual 50-2) (pp. 50–52), by U.S. Air Force, 1975, Washington, DC: Author.

Figure 7.4 Stages in Designing Instructional Systems

System Level	1. Analysis of needs, goals, and priorities. 2. Analysis of resources, constraints, and alternate delivery systems. 3. Determination of scope and sequence of curriculum and courses; delivery system design.
Course Level	4. Determining course structure and sequence. 5. Analysis of course objectives.
Lesson Level	6. Definition of performance objectives. 7. Preparing lesson plans (or modules). 8. Developing, selecting materials, media. 9. Assessing student performance (performance measures).
System Level	10. Teacher preparation. 11. Formative evaluation. 12. Field testing, revision. 13. Summative evaluation. 14. Installation and diffusion.

From *Principles of Instructional Design* (p. 31), by R. M. Gagné, L. J. Briggs, and W. W. Wager, 1992, New York: Harcourt Brace Jovanovich College Publishers.

The Gagné, Briggs, and Wager Model (1992)

In 1992 Gagné, Briggs, and Wager published a revision of the Gagné and Briggs text, *Principles of Instructional Design* (1974, 1979, 1988). Their model incorporates Briggs's theory on the use of levels of objectives to organize a course. Levels of objectives mean developing objectives from goals to specific objectives for each component of a course. In its procedural explanations this model combines Briggs's ideas on educational system design with Gagné's theories on types of learning and differing conditions for instruction. The educational system design part of their model is summarized in Figure 7. 4.

The Smith and Ragan Model (1993)

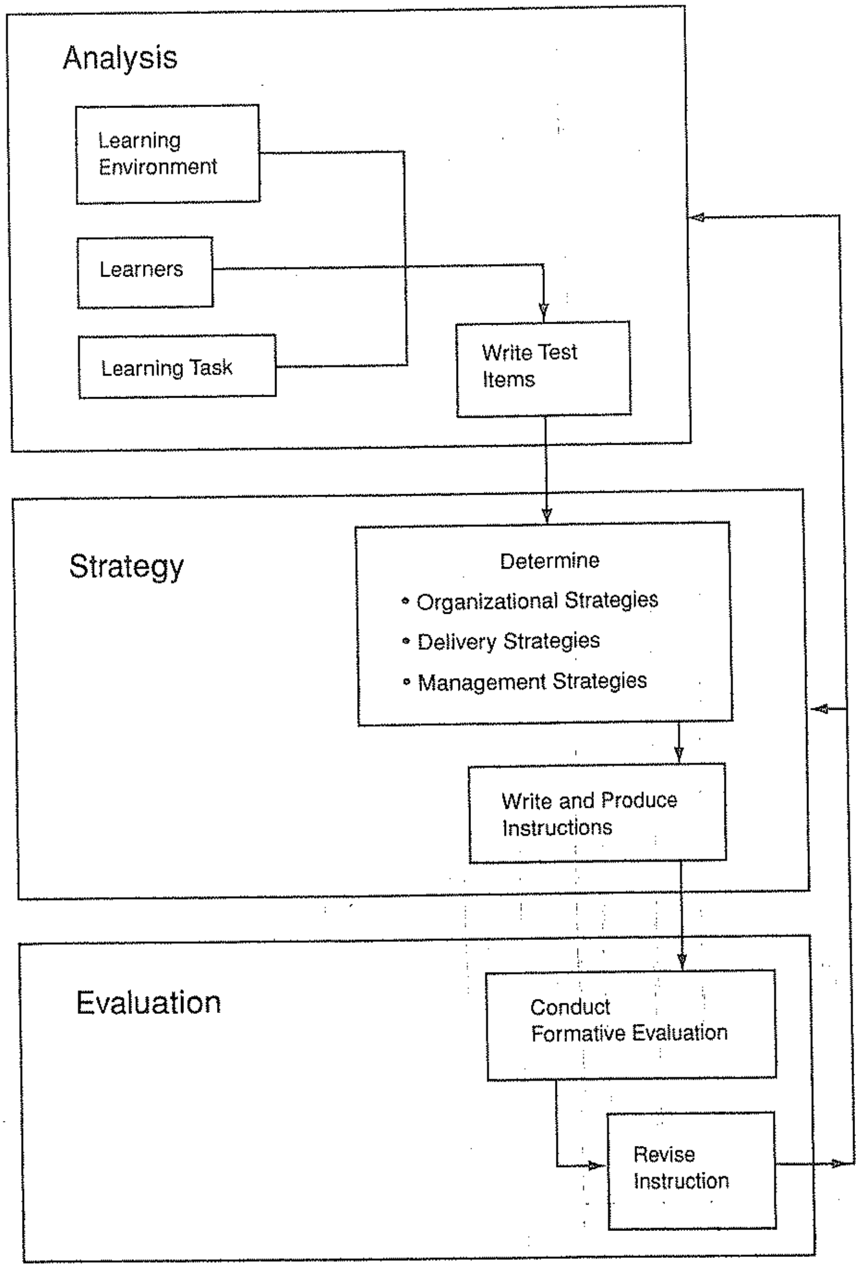
According to Smith and Ragan, the designer goes through a three-stage process: analysis, strategy development, and evaluation. They believe these three stages are common to most instructional design models. They qualify their model by cautioning that although designers usually follow the stages in the order listed, circumstances can cause the designer to modify the sequence or to do steps concurrently. Their model differs in that test items are written within the analysis stage right after tasks are analyzed. They also stress the iterative nature of design, which results in constant revision. Their model is shown in Figure 7.5.

The Kemp, Morrison, and Ross Model (1994)

This model differs the most from the other models. As it has evolved over the years, it has moved further from linearity. The model was introduced in a text in 1971. Figure 7.6 shows the 1994 model.

The 1994 model presents nine design elements that can be approached by different paths. In addition, two outer ovals indicate that revisions occur throughout the process. The first outer oval provides for formative evaluation and revision, the second for project management, summative evaluation, planning, and support services. A problem with the model is inadequate detail on doing instructional analysis. A strength of the model is its step of identifying delivery strategies (large group, small group, independent study).

Figure 7.5 The Smith and Ragan Model

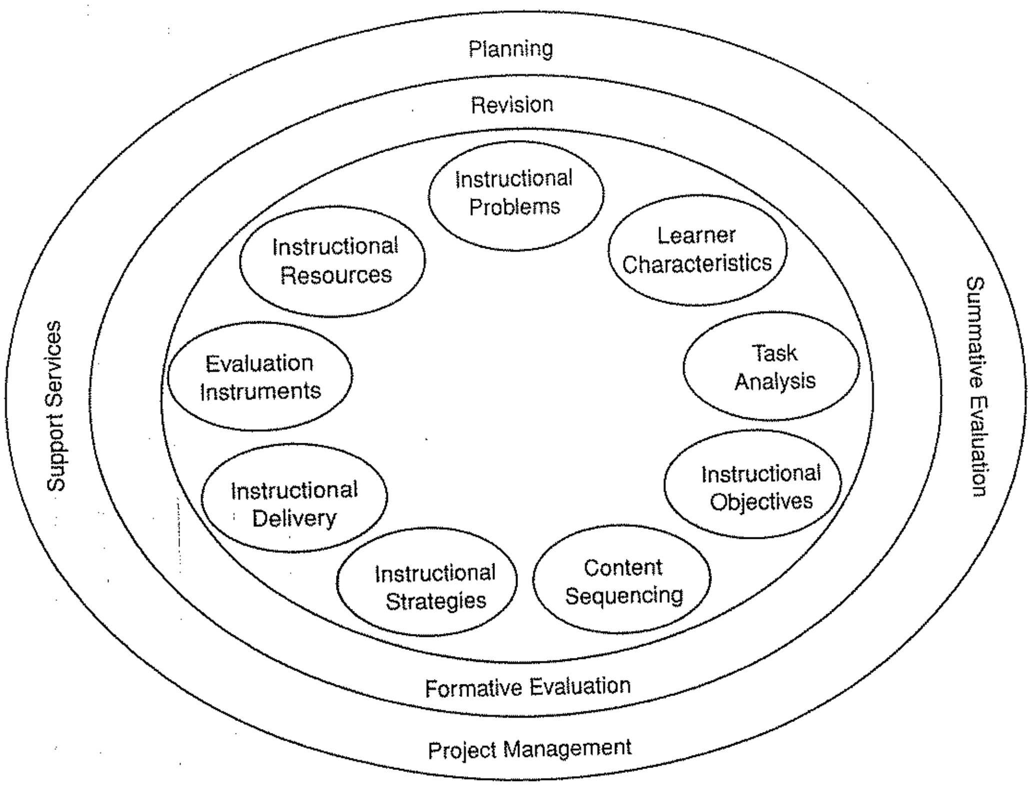


From *Instructional Design* (p. 8), by P. L. Smith and T. J. Ragan, 1993, New York: Macmillan. Copyright 1993 by Macmillan Publishing Co. Reprinted with permission.

The R2D2 Model (1995)

Willis (1995) describes a model that emerged from work at NASA's Johnson Space Center and the Center for Information Technology in Education at the University of Houston known as the R2D2 Model. He contrasts this model, which evolves from constructivist thought, with traditional models, which he believes come from the behaviorist tradition. He presents this model as more appropriate when designing for newer technologies because it allows for merging the steps of design and development as happens

Figure 7.6 The Kemp, Morrison, and Ross Model



Elements of the Instructional Design Plan

From *Designing Effective Instruction* (p. 9), by J. E. Kemp, G. R. Morrison, and S. M. Ross, 1994, New York: Merrill/Macmillan College Publishing. Copyright 1994 by Merrill/Macmillan College Publishing. Reprinted with permission.

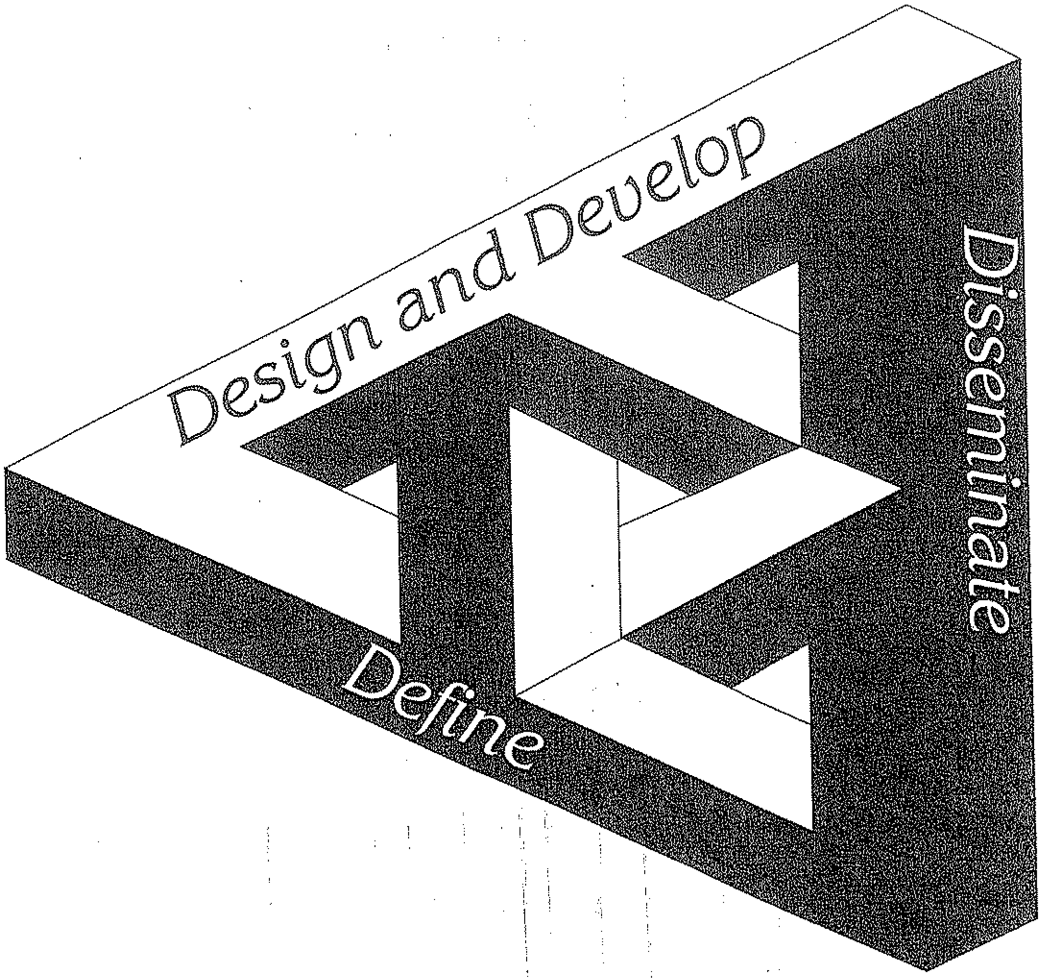
in rapid prototyping where parts of the project are conceived, produced, and evaluated quickly during the ISD process.

The name of the model stands for "recursive" and "reflective" and "design" and "development." "Recursive" in this context means "iterative" in that the same decisions may be addressed many times during the process. Final decisions emerge gradually over the course of the project. This characteristic is not unique to this model; although there is less emphasis in this model on front-end analysis, which includes needs analysis and determining objectives. "Reflective" means that the designer must give attention to the influence of context throughout the project. The stage of design and development also includes formative evaluation, which is emphasized because it occurs early enough in the process to allow for changes based on both objective and subjective data. This model will be discussed in more detail later in the chapter when the constructivist paradigm is considered. The R2D2 model is shown in Figure 7.7.

The Reiser and Dick Model (1996)

This linear model is intended for teachers. Unlike the Kemp, Morrison, and Ross Model, it does not allow you to choose the step you start with. It also presents a shorter process with fewer steps. Through the use of scenarios, the book that supports the model involves the teacher in a real life problem that instructional design can solve if this model is used. The Reiser and Dick Model is presented in Figure 7.8.

Figure 7.7 The R2D2 Model



From "A Recursive, Reflective Instructional Design Model Based on Constructivist-Interpretivist Theory," by J. Willis, 1995, *Educational Technology, 35*(6), p. 15. Copyright 1995 by Educational Technology Publications. Reprinted with permission.

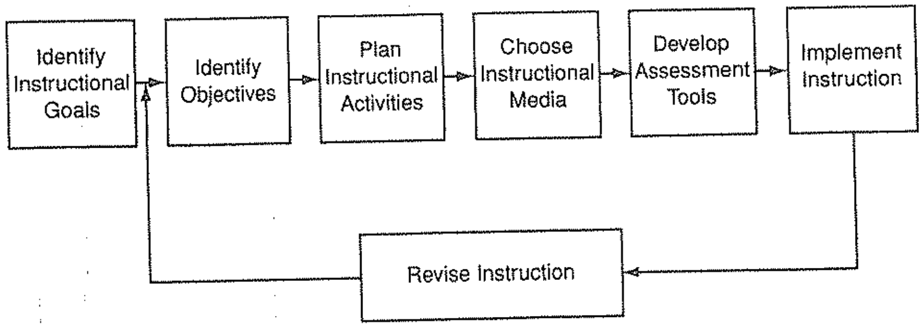
The Dick and Carey Model (1996)

This model was presented in a text for instructional designers published in 1978 and was revised in 1985, and 1990 (Dick, 1996). The text is used extensively in colleges to train instructional designers. Dick and Carey expanded the task analysis step to encompass instructional analysis. In the newest edition, they add the step of analyzing learners and contexts. The model describes the instructional design process from assessing needs to identifying goals through writing objectives to developing materials and evaluating instruction. Figure 7.9 presents the 1996 version of the Dick and Carey model.

The Seels & Glasgow ISD Model II: For Practitioners (1997)

As you have probably surmised by now, these models are variations on the generic ISD model and on each other. They are adaptations or redefinitions of previous models. This text introduces a new adaptation or variation intended for beginning students in instructional design. This is the Seels & Glasgow ISD Model II: For Practitioners presented in Figure 7.10.

Figure 7.8 The Reiser and Dick Model



From *Instructional Planning: A Guide for Teachers* (p. 5), by R. A. Reiser and W. Dick, 1996, Needham Heights, Massachusetts: Allyn and Bacon. Copyright 1996 by Allyn and Bacon. Reprinted with permission.

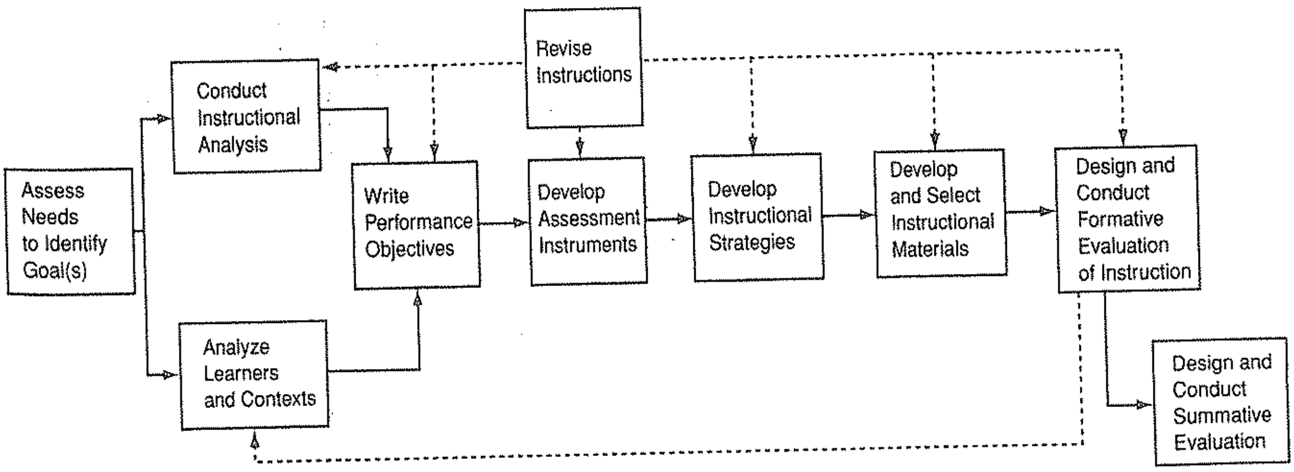
The ISD process presented in the Seels & Glasgow ISD Model II: For Practitioners is based on the assumption that design happens in a context of project management. A project management plan is formulated and revised as necessary. This plan establishes roles, tasks, timelines, budget, checkpoints, and supervisory procedures. The steps are undertaken within the parameters of a project management plan divided into three phases:

1. needs analysis management;
2. instructional design management; and
3. implementation and evaluation management.

Diffusion, or promoting the adoption and maintenance of the project, is an ongoing process. Members of the design team may change depending on the phase in process. Each of the components of this model will be discussed separately.

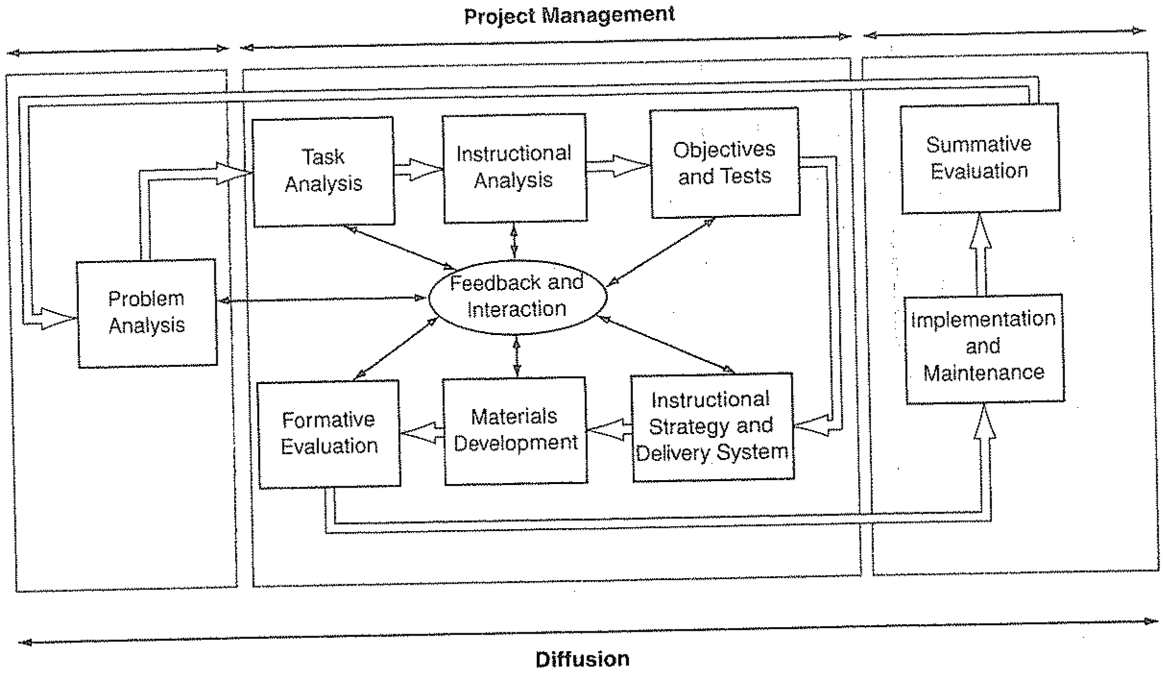
The first phase of project management is to find the solution using needs analysis. This phase encompasses all of the decisions prompted by the questions associated with conducting needs analysis and formulating a management plan. This means questions related to needs assessment (goals), performance analysis (instructional requirements), and context analysis (constraints, resources, and learner characteristics) are addressed during this phase.

Figure 7.9 The Dick and Carey Model



From *The Systematic Design of Instruction* (pp. 2–3), by W. Dick and L. Carey, 1985, New York: Harper/Collins College Publishers. Copyright 1996 by Harper/Collins College Publishers. Reprinted with permission.

Figure 7.10 The Seels and Glasgow ISD Model 2: For Practitioners



The second phase of project management includes all the steps related to design, development, and formative evaluation. These steps are done in order or, in some cases, concurrently, but the process is iterative. The steps can be returned to again and again, and decisions changed or adjusted as current data warrants. The designer can proceed to the next step before a step is finished and then return when ready. Each decision is followed by data collection and interaction with other members of the team. Consequently, changes are made as problems are revealed. There is flexibility to do task analysis at the same time instructional strategy decisions are considered and to do task analysis, instructional analysis, and writing objectives and tests concurrently. Similarly, objectives and assessment strategies can be evaluated formatively as they are developed.

The third phase of project management, implementation and evaluation management, involves transferring the program or product to a real life setting for continued use. For this to occur, several areas have to be attended to:

- Training materials and programs must be prepared.
- Training must be conducted and evaluated.
- Support systems and materials must be provided.
- Instruction must be evaluated summatively.
- The project must be disseminated.
- The ideas must be diffused.
- Instructors and learners must be trained to use new technology.

Even at this stage, revisions may be necessitated. Summative evaluation may yield data, impelling revision in the needs analysis and, consequently, in the design.

Diffusion, which means persuading others to adopt and maintain the innovation, is an ongoing process. The strategies that lead to diffusion are most effective if used during all the phases of a project. For example, designing an innovation that is user-friendly and has obvious benefits is a diffusion strategy. These characteristics can evolve from the first and second phases of project management. Another strategy is to involve potential participants, especially those likely to be early adopters. This can be done during all three phases. In the same vein, potential adopters can be moved through stages of awareness, interest, and trial during all three phases by targeted communication efforts. In the third phase, implementation management, opinion leaders and gatekeepers can be identified and targeted. Diffusion and dissemination of a project will be discussed in chapter 12, "Implementing Instruction."

In the Seels & Glasgow ISD Model II: For Practitioners, generally the steps are done in this order, at least for the initial attempt at outputs from a step. However, it is not necessary to complete a step before proceeding, and the order can be changed so that steps can be performed concurrently. For example, task analysis and instructional strategy decisions are sometimes considered concurrently. However, even in this case to some extent information about what is to be learned is gathered first. The order of steps can be modified to allow decisions about tasks and sequencing to be made in conjunction with each other. Similarly, it might be important to do the steps of objectives and tests and formative evaluation together in order to gather input on direction and approach early in the process. The rapid prototyping part of formative evaluation can necessitate doing several steps together or in brief. However, if the steps of the Seels & Glasgow ISD Model II: For Practitioners are assumed to be linear, then the flow would be as follows:

1. Find the problem through needs analysis. Determine whether there is an instructional problem: Collect information through needs assessment and context analysis techniques, and write a problem statement.
2. Plan for diffusion and project management.
3. Through task analysis collect more information on performance standards and skills and on attitudinal requirements. Then do an instructional analysis to determine the prerequisites.
4. Write behavioral objectives and criterion-referenced tests to match those objectives.
5. Determine the instructional strategy or components of instruction, such as presentation or practice conditions. Select delivery systems that will allow you to meet these conditions.
6. Help plan for production. Monitor materials development to assure project integrity.
7. Plan a formative evaluation strategy. Prepare to collect data. Revise as feasible and re-evaluate.
8. Plan for implementation and maintenance of the instruction.
9. Conduct summative evaluation. Revise goals if necessary. Adjust design accordingly.
10. Disseminate the innovation.

Table 7.2 compares the Seels & Glasgow ISD Model II: For Practitioners with the ISD model presented in Part I of this text as the ADDIE approach.

Exercises A, B, and C at the end of this chapter provide for practice on identifying ISD models.

THEORIES OF LEARNING

Instructional designers look to learning psychology for the answer to the question "What conditions lead to what outcome?" Out of theory about how learning occurs and associated research has come considerable knowledge regarding how to establish conditions to increase the likelihood that learning will occur. "Theory" is a global term used to specify particular ways of looking at things, explaining observations, and solving problems. Three major theories of learning are behaviorism, cognitive science, and constructivism. These theories can be described as philosophical paradigms or patterns that affect design decisions. The question of whether traditional ISD models are appropriate for all three paradigms is one being debated currently.

Table 7.2 A Comparison with the ADDIE Model

Steps in ADDIE Model	*Steps in S & G Model*	*Questions Answered*
1. Analysis	1. Needs Analysis	What is the problem? What are the parameters of the problem?
	2. Task and Instructional Analysis	What should the content be? What are the prerequisites?
2. Design	3. Objectives and Assessment	What should be assessed and how?
	4. Instructional Strategy	How should instruction be organized?
	5. Delivery System Selection and Prototyping	What will the instruction look and sound like?
3. Development	6. Materials Development	What should be produced?
	7. Formative Evaluation	What revisions are needed?
4. Implementation	8. Implementation and Maintenance	What preparation is needed?
5. Evaluation	9. Summative Evaluation	Are the objectives achieved?
	10. Diffusion and Dissemination	Has the innovation been disseminated and adopted?

The issue is whether existing models can be adapted to differing viewpoints or whether it is necessary to start with new assumptions and models. In other words, can the ISD paradigm encompass design based on cognitive science as well as constructivist paradigms, or is the ISD paradigm tied to behavioristic principles? If the latter is true, then processes developed for constructivist projects should be described as instructional design, but not ISD. Before we elaborate on this controversy, which is largely a definitional debate, we need to explain theories of learning and paradigm differences.

Behaviorism

Behaviorism is an orientation in psychology that emphasizes the study of observable behavior. It grew out of an attempt by early psychologists to make the study of behavior more objective. The premise of the behaviorist schools is that, instead of trying to understand vague internal processes, psychologists should concentrate on actions that are plainly visible, thereby making the study of behavior more scientific. Stimuli (conditions that lead to behavior) and responses (actual behavior) are the observable aspects of behavior. Behaviorists are concerned with discovering the relationship between stimuli and responses in order to predict and control behavior. That does not mean they are not concerned with thinking. Rather, they are interested in discovering the external controls which affect internal processes. They are less concerned with mental processes, since they can only be inferred.

The first application of behaviorism to instructional design came with the programmed learning movement. B. F. Skinner, one of the more prominent American behaviorists of the past half century, was chiefly interested in the learning process. He applied laboratory findings to complex forms of human learning by a technique called "programmed learning." In this technique the information to be learned is broken down into very small steps. At each step a single new term or idea is introduced and material previously covered is reviewed. Students respond to each step in a manner appropriate to the instruction, for example by answering a question or filling in a blank. The student is immediately told whether the answer is right or wrong. As the student progresses through the programmed materials, his or her behavior is gradually shaped until the learning objective is achieved. Textbooks, audiovisual devices, and computers have been used to present programmed materials.

Behaviorism influenced the course of instructional design for many years and continues to do so. It has provided precise prescriptions about what conditions lead to what outcomes. Its basic approach has been controversial, however, because it eschews references to mental events and does not adequately explain some complex human performance. For example, it cannot adequately explain how children learn grammar (Chomsky, 1969).

Cognitive Psychology

Psychologists have always been interested in mental processes. The first psychologists were chiefly interested in studying human consciousness and used a form of self-analysis called "introspection" to analyze the processes of their minds. This approach was rightly criticized as unscientific. In fact, behaviorism was a reaction against these methods, and for many years it was the major force in psychology.

There was a shift from behaviorism to an interest in the organization of memory and thinking. Among the factors that have shaped the cognitive science movement are computer programming and the work on artificial intelligence. For cognitive scientists, the basic model of the mind is an information processing system. Their orientation is a relative lack of concern with stimuli and responses and an interest in more holistic, internal processes (e.g., problem solving, comprehension, etc.).

Information processing and computer simulation are techniques used for theorizing about cognitive processes. Information-processing analysis is a technique for describing the presumed flow of information during cognitive processes. The flow diagrams show decision points and the sequences of the cognitive processes under study. In computer simulation a theory of cognitive operations is translated into a computer language and run as a program. If the performance of the computer matches human performance on the same task, then the theory that underlies the computer program is presumed a plausible one for human performance.

While the emphasis on cognition has focused attention on areas previously neglected, research on cognitive processes is based on a number of assumptions that are not easily verified, for example, that human thinking is analogous to computer programming. Likewise, the diagrams used to hypothesize about cognitive structures cannot be verified by direct means. In fact, it is generally true in cognitive psychology that the same performance can be accounted for by different theories about mental processes (Gagné, 1985). Nevertheless, the cognitive science movement has added many principles of design to our knowledge base (West, Farmer, & Wolff, 1991; Tennyson, 1995). Cognitive scientists are interested in how learners acquire knowledge and skills, rather than how behavioral responses are conditioned.

Instructional systems design has adopted many of the strategies developed by the cognitive science movement. The most important of these strategies is making a distinction between novices and experts especially when analyzing tasks and designing and evaluating instruction. Other important contributions are the comparison of mathemagenic and generative learning strategies, the role of schemata and imagery in knowledge acquisition, and the use of assessment for diagnosis. A brief explanation of each of these will help you understand this paradigm.

Mathemagenic approaches prescribe strategies by externally mediating instruction (Jonassen, 1988). For example, students may be given a cognitive map or asked to construct one given concept relationships. Generative strategies, on the other hand, require that students mentally construct the maps. Thus, instruction is internally mediated by the student. A schema is an organized knowledge structure. This means that frameworks for remembering are constructed and maintained. Schemas change as knowledge is acquired and stored. Some researchers believe that schemas incorporate both visual and verbal knowledge. Imagery refers to mental representations of knowledge that incorporate physical attributes. These "pictures in the mind" can serve as cues for memory. Because cognitive science emphasizes adjusting to a learner's thinking patterns, assessment data can be used to determine what content is delivered in what order or what remedial paths that are required.

Constructivism

Supporters of this paradigm claim that learning is more than conditioning or acquired knowledge, rather it is constructed knowledge. By constructed they mean that learners can only interpret information in the context of their own experiences. Learning must be personalized, set in authentic contexts, and oriented to problem solving. Constructivists are very interested in learning environments (spaces, places, settings) where learners can use tools and devices while interacting with others (Wilson, 1995, 1996).

Many constructivists believe that traditional ISD models are incompatible with the basic tenets of this paradigm. Among the reasons for this are beliefs that learning cannot be predetermined and that quantitative assessment is inadequate as a measure of personalized learning. Instead, constructivism, which has many roots in social psychology and other social learning paradigms, proposes that learning (a) allow students to assume roles and interact with others; (b) present problems, puzzles or challenges that must be solved; (c) emphasize intrinsic awards; (d) be personalized in meaning and assessment; (e) occur in realistic settings; (f) involve the learner in goal setting; and (g) encourage multiple perspectives. This paradigm has benefited from the development of interactive multimedia technology which makes realistic simulated environments practical.

On the other hand, some constructivists have developed ways to apply the paradigm within the basic ISD model (Willis, 1995; Wilson, Teslow, & Osman-Jouchoux, 1995; Bednar, Cunningham, Duffy, & Perry, 1995). To do this, they follow the essential steps but do this in ways consistent with the paradigm. They believe that ISD requires a systematic approach and the steps of design and evaluation but not behavioral objectives. Those who believe the ISD paradigm requires the use of behavioral objectives do not accept this constructivist adaptation. The issue thus becomes one of definition of ISD, not a debate about whether systematic constructivist design is possible. Therefore, constructivist design can be called instructional design or ISD depending on your definitional position (Seels & Richey, 1994). A more important issue is how learning is to be evaluated with constructivist design. For example, when can group activities provide acceptable criteria for assessment of individuals?

IMPLICATIONS FOR INSTRUCTIONAL DESIGN

Richey (1986) discusses the implications of behavioral and cognitive theory for instructional design. She notes that instructional design has been affected by both theories of learning, with the cognitive school having prominence at this time. As a result of the cognitive theorists' interest in mental processes, there is now interest in building instruction to facilitate thinking processes. However, Richey points out that instruction is still focused on behavioral outcomes. Her discussion of behavioral theories concludes with the following:

> Ultimately, the most fundamental application of behaviorist thought in instructional design is the reliance on observable behaviors as the basis for instruction. Performance, or behavioral, objectives describe goals using action verbs. All knowledge is cast in terms of the observable evidence of such knowledge. Test

> items relate to such statements, and the entire delivery process is directed toward facilitating new learner behaviors. This orientation can also be extended to instruction related to values or attitudes. This is an almost universal approach among designers, and it stems directly from the behaviorist learning theories. (p. 65)

Since this was written the number of instructional design projects based on cognitive science and constructivist principles has greatly increased. Today, all three paradigms play a significant role in the generation of instructional design applications.

A Comparison of Design Dimensions

To understand the role that these paradigms play, we can compare the theoretical positions taken in relation to different aspects of instructional design. It is important to realize that those concerned with theory often have more interest in the purity of paradigm applications than those concerned with practice. Practice by its nature is more practical, which often translates into a more flexible and pragmatic application. Thus, when these paradigms are applied, it is not unusual to find some eclectic integration of principles from more than one paradigm. Examples and issues related to application of paradigms and implications for use of models will be discussed after the paradigms are compared.

Paradigms can be compared on several dimensions, including (a) definition of learnings, (b) the types of learning emphasized, (c) the instructional strategies employed, (d) the media preferred, and (e) the key concepts embodied. Table 7.3 compares the three paradigms on these dimensions.

Table 7.3 is based on publications in the instructional technology field that explain the viewpoints of the different paradigms. You can research a paradigm that interests you by using these sources:

Behaviorism: Gropper, G. L., 1983; *Behaviorism Today,* 1993; Seels, 1995; Ely & Plomp, 1996.
Cognitive Science: Brezin, 1980; Bonner, 1988; West, Farmer, Wolff, 1991; Seels, 1995.
Constructivism: Fosnot, 1984; Jonassen, 1991; Duffy & Jonassen, 1992; Seels, 1995; Wilson, 1995, 1996.

Issues Around Paradigms and ISD Models

Concerns about the use of traditional ISD models come mainly from constructivists, because the principles of cognitive science have been integrated in ISD models. The Dick and Carey Model (1996), for example, emphasizes information processing through the step of instructional analysis. The Smith and Ragan Model (1993) incorporates differences between novices and experts and instructional strategies appropriate to learning outcomes and domains.

Therefore, this review of the issues around paradigms and models addresses constructivist approaches to adapting models. Those who argue that it is impossible to adapt ISD models for this paradigm often are prompted by problems that arise when lock-step models are used for interactive multimedia development. One answer may be to adapt an ISD model based on a more flexible, cognitive or constructivist approach. One of the reasons traditional ISD models worked was that the teacher could adapt training as needed. This is not possible with interactive multimedia instruction ("To ISD or Not to ISD," 1996).

Bednar, Cunningham, Duffy, and Perry (1995) suggest aspects of ISD that must become more flexible when a constructivist paradigm is adopted. Content analysis is not important because content cannot be prespecified. Domains can be defined, but specific objectives must come from a student's perception of relevancy. Students should be encouraged to develop multiple perspectives on a task. Analysis of representative learners is not appropriate, because it is the individual learner that is important. The focus is on the learner's level of reflectivity. Here is their position on specification of objectives:

> From a constructivist perspective, every field has its unique ways of knowing, and the function of analysis is to try to characterize this. If the field is history, for example, we are trying to discover ways that historians think about their world

Table 7.3 Instructional Design Paradigms

	Behaviorist	*Cognitivist*	*Constructivist*
Learning is	Change in overt behavior due to conditioning	Programming of a new rule for information processing	Personal discovery based on insight
Types of Learning	Discrimination, Generalization, Association, Chaining	Short-term sensory storage, short-term memory, long-term memory	Problem solving
Instructional Strategies	Present and provide for practice and feedback	Plan for cognitive learning strategies	Provide for active, self-regulating, reflective learner
Media Strategies	Variety of traditional media and CAI	Computer Based Instruction	Responsive environment
Key Concept	Reinforcement	Elaboration	Autotelic principle (intrinsic motivation)

From "The Instructional Design Movement in Educational Technology," by B. Seels, in *Educational Technology, 44*(3), p. 13. Copyright 1995 by Educational Technology Publications. Reprinted with permission.

> and provide means to promote such thinking in the learner. Our goal is to teach how to think like a historian, not to teach any particular version of history. Thus constructivists do not have learning and performance objectives that are internal to the content domain (e.g., apply the principle), but rather we search for authentic tasks and let the more specific objectives emerge and be realized as they are appropriate to the individual learner in solving the real world task. (p. 106)

This is similar to the rationale made by Bruner (1966) for curriculum based on the "structure of the discipline" (Seels, 1995). However, the emphasis here is also on objectives evolving as tasks are tackled.

It is particularly difficult to reconcile positions on evaluation. Traditionally, ISD sets standards for success through predetermined objectives. This is impossible to do with the constructivist paradigm. Many employers want training to be done in groups with predetermined objectives and evidence of outcomes. While the constructivist paradigm does allow for evidence of outcomes, it is often primarily subjective evidence. Coupled with increased resource needs, the difficulty of determining outcomes and organizational outputs can create problems.

One approach that has been suggested is the use of different kinds of objectives. There are formats for writing objectives that are not behavioral. Formats appropriate for the constructivist approach are the problem solving or expressive objectives proposed by Eisner (1969, 1979). In a problem-solving objective a specific problem is presented to the learner, but there are many means by which the problem can be solved. The ends are closed and definite, but the means are an open system. With expressive objectives both the means and the ends are open-ended. The learner is provided with a rich experience. There are no preformulated behavioral objectives. For example, an expressive objective for early readers may be that given a mentor they will develop and publish a newspaper. Through this newspaper project they will develop new skills by being engaged with relevant material of intrinsic concern. Expressive objectives usually require a tutor or mentor to provide feedback and advice for the student.

The problems with using this approach for instructional design are evident. How do you determine to what extent you have achieved the goal? Will you be satisfied no matter what kind of newspaper the student produces? If this is a group project, what is expected of the individual student? Remember that according to constructivist theory, there must be allowances for individual differences in achievement. The expressive objectives format needs more theoretical and practical development. For example, innovative ways to measure achievement need to be identified. The Arts Propel Project ("Team Develops Exercises," 1987) has had some success with a portfolio used in conjunction with a tutorial as a way of measuring growth in aesthetic ability and following Eisner's (1969, 1979) recommendation to measure process instead of product.

Another issue is whether simply having no predetermined objectives and self-assessment means the design is constructive. It is not if the strategies used are traditional lecture/demonstration with no provision for constructing knowledge or solving challenging problems in the lesson.

> Rather, *authentic tasks* should be provided, within complex, real-world learning environments, allowing specific objectives to emerge that are relevant to the individual learner. Learning sequence should not be controlled, and multiple perspectives should be provided. Experts and teachers should model and coach, but not in a scripted or predetermined way. Evaluation should be goal-free and should examine the learner's process of constructing knowledge as well as the outcome or product. Constructivist perspectives are popular with some developers of hypermedia or multimedia instructional systems, in which it is possible to simulate reality and allow learners to select their own learning goals and sequence by navigating through various databases and media resources. (Gagné and Medsker, 1996, p. 12, authors' emphasis)

Other issues that relate to paradigms have to do with values. Rowland (1995) takes the position that the traditional criteria for ISD can interfere with creativity in design. Dick (1995) responds that that we can't have the same criteria for everything we design.

Current literature presents two positions: (a) ISD models must expand and become more open, or ISD will not survive; and (b) the basics of traditional ISD must be retained (Seels, 1995). It will be interesting to see how these positions are reconciled.

Characteristics of Design Based on Paradigms

So far, this discussion has been rather abstract. Let's turn now to more specific examples of the implications of these paradigms for design. We will do this in four ways:

1. a comparison of goals, assessment, and strategies as interpreted by the paradigms;
2. Dick's (1996) comparison of applications of the Dick and Carey model and the R2D2 Model;
3. an examination of problem based learning as a constructivist approach; and
4. RSVP TECH: Restructuring Social Science Via Progressive Technology.

Goals, Assessment, Strategies. In Table 7.4 the goal, assessment, and strategy differences among the paradigms are compared. Some designers take a cognitive science viewpoint that includes aspects of behaviorism, and others take a constructivist viewpoint that includes aspects of cognitive science. The former are sometimes referred to as "neo-behaviorists" and the latter as "cognitive constructivists."

Each paradigm seems to have an affinity for different types of learning and delivery systems. For example, constructivism seems to be particularly appropriate for developing problem-solving skills; while cognitive science provides powerful tools for concept development. Research has shown that terminology is often learned best through behavioristic reinforcement of verbal association. Nevertheless, facts can be learned through cognitive science approaches, and problem-solving procedures can be learned through behaviorism. Each paradigm can be used for many types of learning. Still, it is possible that the theoretical basis for use of paradigms will eventually be clarified through affinity for types of

Table 7.4 Goals, Assessment, and Instructional Strategies Compared

	Goals	*Assessment*	*Strategies*
Behaviorism	Predetermined, behavioral	Of products and process	Cued practice reinforced through immediate feedback
Cognitive Science	Predetermined, goal-driven, statements of purpose	Diagnostic, of mental representation and processing	Chunking Concept mapping Advance organizer Rehearsal Imagery Mnemonics Analogy Visual frames
Constructivism	Not predetermined, negotiated, both goal-driven and personal goals	Of process and product, personalized	Argument Discussion Debate Collaboration Reflection Exploration Interpretation Construction

learning in a manner similar to the way delivery systems are distinguished to some extent by their relationship to paradigms (Seels & Richey, 1994).

It is equally possible that philosophical arguments will be reconciled, and there will be a merging of the paradigms within an ISD paradigm. This is in fact the trend today (Wilson, Teslow, & Osman-Jouchoux, 1995). It is important to realize that practicing instructional designers may not worry about whether an approach represents a consistent application of a paradigm. Often they make decisions instead on the basis of what works and find ways to use aspects of more than one paradigm. This situation reflects the researcher and practitioner roles in the field that were discussed in chapter 1.

Applying the R2D2 Model. Dick (1996) compared the application of the R2D2 Model reported by Willis (1995) with applications of the Dick and Carey Model. The R2D2 Model is shown in Figure 7.7, and the Dick and Carey Model is shown in Figure 7.9. In his constructivist approach Willis' model purposively has no beginning or ending and implies continuous interaction among Design and Develop, Define, and Disseminate. The focus is on design and development because extensive front-end analysis is not necessary. The R2D2 Model is applied to a CD-ROM project about a simulation to enhance literacy skills. Dick's summary of Willis' instructional design process is given in Table 7.5.

Although task analysis was used, the output differs in that it leads to selection of an authentic reading task, a simulation of a job-hunting process, rather than a breakdown of tasks and sub-tasks. Pre-determination of objectives was not deemed important as long as teachers, students, and designers were involved in the process from the beginning. Because learning goals can be set individually, and the assessment uses methods such as journals, portfolios, and anecdotal reports, Willis does not try to do summative evaluation. Willis argues that this process represents a purer constructivist approach than modifications to traditional ISD models. He believes that these models cannot be adapted without major assumptions being questioned.

Table 7.5 Willis's Instructional Design Process

Willis's Instructional Design Model Focal Points and Tasks	
Definition Focus	Front-End Analysis Learner Analysis Task and Concept Analysis (No statement of instructional objectives)
Design and Development Focus	Media and Format Selection Selection of a Development Environment Product Design and Development Rapid Prototyping and Formative Evaluation
Dissemination Focus	Final Packaging Diffusion Adoption (No summative evaluation)

From "The Dick and Carey Model: Will It Survive the Decade?" by W. Dick, 1996, *Educational Technology Research and Theory, 44* (3), p. 61.

Problem-Based Learning (PBL). Savery and Duffy (1996) describe problem-based learning as a way to link the theoretical principles of constructivism, the practice of instructional design, and the practice of teaching. Alavi (1995) describes PBL as

> A problem-based learning course is not a course in general problem solving, but focuses specifically on content (or subject-matter) central to the area of study by requiring students to acquire important knowledge in the process of tackling problematic situations . . . A problem-based course does not begin with a series of lectures; it begins with a problem-situation which the students have to begin to deal with in a problem-based tutorial . . . Typically, then, having been presented with a problem-situation, students will work co-operatively in small groups in coming to grips with the problem, in formulating it adequately, in identifying what they need to learn in order to deal with it, and so on . . . . (pp. 2, 4)

Problem-based learning was first developed by Barrows (1985) for training medical students to be effective at using information to solve problems rather than to become walking encyclopedias. It is compatible with the constructivist paradigm in that it establishes a situation in which learners interact with an information environment while working collaboratively with others to define a problem, generate hypotheses, gather data, and solve the problem. The problem presented is authentic and complex. For example, medical students would have to construct or use a patient's medical history, or make a diagnosis and compare it with actual outcomes. Students can decide to pursue sub-problems or to stay with one problem during the course. A structure for problem-based learning is provided (Alavi, 1995). Sometimes the structure involves defining a situation in need of improvement (SINI).

Because students have ownership of the problem and develop their own goals within a structure that creates an environment, this approach can be considered a constructivist approach. It follows systematic design principles in that goal setting, assessment strategies, and instructional strategies are consistent with each other. Assessment strategies include self-evaluation and peer-evaluation through surveys about process and rubrics.

RSVP TECH: Restructuring Social Science Via Progressive Technology. Constructivist design requires a rich information environment that students can use to explore, interpret, and debate positions. One example of such an environment is provided by a project funded by the Office of Educational Research and Improvement (OERI) in the U.S. Department of Education. The primary focus of this project is to enhance student achievement by restructuring the standard classroom learning environment and refocusing traditional teaching practices so that students become more active participants in their own learning and share responsibility for that learning. Textbook materials were replaced by primary source such as documents, supplementary readings, and encyclopedias on CD-ROM. The design was implemented at Fullerton Union High School in Fullerton, California.

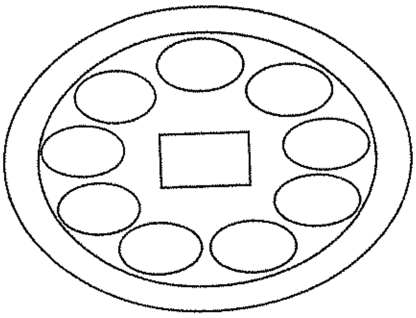
> Juniors participating in RSVP TECH did more than just read about the American Revolution. Student groups (Rebels, Loyalists, Indians, French, British, Blacks) debated the causes of the Revolutionary War. Student pairs played delegates at a convention and constructed their own constitution. Electronic mail enabled them to "send" their proposals to the teacher, who then merged, copied, and distributed them for use in debate. Role-playing, debate, and technology also enlivened study of the Jacksonian Era and the Civil War.
>
> After only one semester, RSVP TECH achieved documented results. When compared with their control group peers, students in the program achieved higher objective test scores, higher essay test scores for historical content, and higher ratings in history interviews. ("Making History Come Alive," 1993, p. 3)

Exercises D and E provide practice related to learning theory paradigms as they relate to ISD.

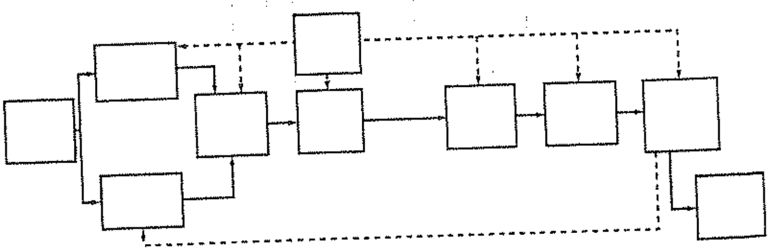
EXERCISES

A. An Exercise Designed as a Test of Your Knowledge of ISD Models

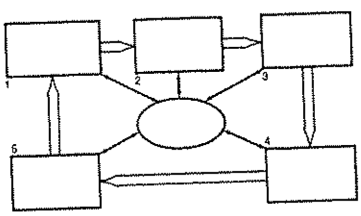
1. Match the schematic with the name of the model it represents.
   _____1. Air Force Model
   _____2. Kemp, Morrison, and Ross Model
   _____3. IDI Model
   _____4. Dick and Carey Model



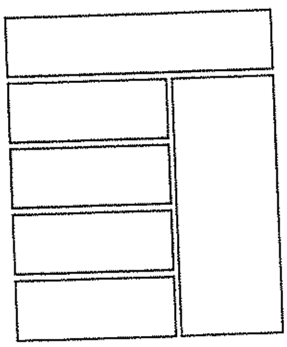
____ a.



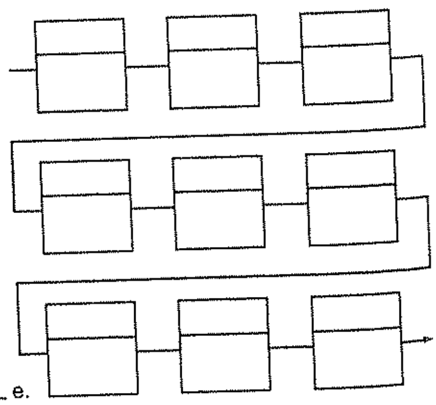
____ b.



____ c.



____ d.



____ e.

Table 7.6

Model	Year	Configuration	Unique Characteristics
IDI			
Air Force			
Gagné, Briggs, & Wager			
Smith & Ragan			
Kemp, Morrison, & Ross			
R2D2			
Reiser & Dick			
Dick & Carey			
Seels & Glasgow			

2. Match the phrase with the model it describes.

   _____1. There are three phases in instructional design: analysis, strategy, and evaluation.
   _____2. Instructional design takes place in a context of project management.
   _____3. The designer develops specifications for the system, course, and lesson level.
   _____4. These two models emphasize the flexible nature of design because they have no beginning or ending.
   _____5. There are few steps in this model for teachers.

   a. Reiser and Dick Model
   b. Gagné, Briggs, and Wager Model
   c. Seels and Glasgow Model
   d. Smith and Ragan Model
   e. Kemp, Morrison, and Ross Model
   f. R2D2 Model

B. An Exercise on Your Understanding of and Reaction to the Seels & Glasgow ISD Model II: For Practitioners

In an essay, explain and react to the nature and flow of the instructional design process presented in the Seels and Glasgow Model. Compare and contrast your reaction to this model with your reactions to some of the other models in this chapter.

C. An Exercise Designed to Help You Distinguish Among Models

Complete the chart in Table 7.6 for each of the models presented in the text.

How would you explain the variations among models? Speculate on reasons for these variations.

D. An Exercise to Check Your Knowledge About Theories of Learning

Answer true or false.

1. Programmed learning principles grew out of the behaviorist school of psychology.
2. Flowcharting is not a technique for describing mental processes.

Table 7.7

Instructional Problem ________			
	Behaviorism	Cognitive Science	Constructivism
Goals			
Assessment			
Strategies			
Delivery			
Systems			

3. Cognitive psychologists are interested in the organization of memory and thinking.
4. Constructivist psychologists are interested in learning environments.
5. Behaviorism adequately explains all types of learning.

E. A Group Exercise in Using Paradigms for Instructional Design

This is a dyad exercise in which one partner plays the role of a peer reviewer and the other the instructional designer. Then the roles are reversed.

Using the instructional design problem that you have been working on in previous group and application exercises, try to complete the chart in Table 7.7 for how the design would differ depending on the paradigm. You should be more specific to the topic than in Table 7.4 because you are applying the paradigms to a specific design problem.

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ANSWERS

A. An Exercise Designed as a Test of Your Knowledge of ISD Models

1. 1. c
   2. a
   3. e
   4. b
2. 1. d
   2. c
   3. b
   4. e and f
   5. a

B. An Exercise on Your Understanding of and Reaction to the Seels and Glasgow ISD Model 2: For Practitioners

Your answer should address these points:

- ISD occurs in the context of project management.
- Although the process is generally linear, current theory and practice sometimes necessitate doing steps concurrently or incompletely.
- There are three stages of project management.
- ISD is an iteractive, recursive, and reflective process with constant feedback, interaction, and revision.
- The first phase of project management is directed towards needs analysis.
- The second phase of project management includes all the steps necessary for design and formative evaluation.
- The third phase of project management involves tasks necessary for implementation.
- Diffusion activities should occur throughout the three phases.
- Sometimes data collected will necessitate a change in goals.

In addition to these points, the essay should describe your reactions to the models.

C. An Exercise Designed to Help You Distinguish Among Models

It is important that you complete the chart on your own first before checking with the answers given in Table 7.8. If you do not, you will remember less and be unclear on your reactions. This exercise is designed as a way to review models.

The models vary because they were developed or revised at different points in time and, therefore, reflect

Table 7.8

Model	Year	Configuration (shape)	Unique Characteristics
IDI	1973	box	step of project management, 3 stages
Air Force	1975	cross in rectangle	iterative nature
Gagne, Briggs, & Wager	1992	outline	levels of objectives
Smith & Ragan	1993	rectangle, ladder	assessment in analysis
Kemp, Morrison, & Ross	1994	circle	non-linearity
R2D2	1995	Escher waterfall	constructivist
Reiser & Dick	1996	simple line	few steps
Dick & Carey	1996	complex line	instructional & contextual analysis
Seels & Glasgow	1997	cross in center rectangle with piping across 3 rectangles	phases of project management, emphasis on decision making

earlier models. They were also developed for different audiences in some cases. For example, the Reiser and Dick and Kemp, Morrison, and Ross models are very popular with teachers. The IDI Model was used to disseminate the ISD approach to teachers and administrators. The Dick and Carey Model is intended for novices. There are also variations due to author preferences or experience.

D. An Exercise to Check Your Knowledge About Theories of Learning

1. True
2. False
3. True
4. True
5. False

E. A Group Exercise in Using Paradigms for Instructional Design

The answer to this exercise is shown in Table 7.9.

Table 7.10 is a contrasting example that shows that each paradigm can deal with other types of learning.

After performing this exercise, you should realize that in many cases delivery systems are interchangeable, depending on how they are used. In other words, the workbook could have been used within the constructivist paradigm and the videotape within the behaviorist as long as they were applied in a way consistent with the paradigm. While some technologies have an affinity for a particular paradigm, it is how the technology is used that determines its appropriateness.

Table 7.9

Instructional Problem: To learn about the human body's skeletal system

	Behaviorism	**Cognitive Science**	**Constructivism**
Goals	Given a 30 item objective test on the body's skeletal system, you will answer 90% of the items correctly.	To learn about the parts of the body's skeletal system, how they relate, and health problems associated with this system.	Each learner develops a contract which specifies what their individual goal is in relation to the topic.
Assessment	Multiple-choice, completion, true/false, matching	generate visual representations of concepts and processes	peer and self evaluation through anecdotal reports
Strategies	questions providing practice, immediate feedback	cognitive mapping analogies flowcharts on diagnosing problems	collaboratively making decisions about authentic tasks
Delivery Systems	CBI with a computerized test.	a CBI tutorial with generative strategies	an environment providing information on the skeletal system including an interactive multimedia simulation of skeletal system problems

Table 7.10

Instructional Problem: To learn how to write a 500-word essay			
	Behaviorism	**Cognitive Science**	**Constructivism**
Goals	Given a topic, write a 500 word essay that scores 80 out of 100 points on a checklist.	Given criteria for a portfolio and 3 months, meet the criteria at a level of good or excellent.	The learner negotiates a personal goal related to this problem
Assessment	Writing product	Portfolio reflecting on drafts, process, and final products	Peer review and mentor comments
Strategies	Presentation, practice, and feedback	Imagery Brainstorming Cognitive Mapping	Discussion Debate Interpretation
Delivery Systems	A workbook on writing essays	A videotape on process writing and portfolios	A resource center on writing