Design Models and Learning Theories for Adults

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In This Chapter

- Define ISD models.
- Learn how to expand ISD models to meet current delivery systems.
- Understand how learning theories influence instructional design.

When an organization needs training solutions, the instructional designer must understand the business and individual needs that underlie the training initiative. This requires defining the business drivers for training program development and the organizational results needed or desired.

Once the designer has taken that critical first step, instructional design models and learning theories enter the picture to provide a systematic approach (or plan) for crafting effective and efficient training solutions that meet organizational and individual needs. These plans are referred to as instructional systems design (ISD) models.

Learning theories and the strategies and tactics (that is, lesson designs) derived from ISD models can help practitioners develop optimal instructional designs for learning—designs that support the learners as they acquire the knowledge, skills, experience, and motivation needed to produce results for themselves and their organizations.

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The design phase of ISD models is the point where learning theories and their resulting strategies and tactics primarily come into play. This chapter will discuss ISD with emphasis on two popular approaches: ADDIE and the Dick and Carey model. It will focus on learning theories and their influence on the ISD model design phase.

ISD Models

ISD models are based on the systems approach; the output from one model phase provides the input for the next phase. ISD model origins can be traced to the application of a systems approach by the military starting in World War II. After the war, the military applied the systems approach to the development of training materials and programs.

During the 1960s, the systems approach began to appear in procedural models of instructional design in U.S. higher education and became widely taught through a college consortium including Syracuse, Michigan State, U.S. International University, and the University of Southern California (later joined by Indiana University). This work culminated in a joint project known as the Instructional Development Institute (IDI).

In 1973, the U.S. Department of Defense commissioned the Center for Performance Technology at Florida State University to develop procedures to substantially improve Army training. These procedures evolved into a model that was adopted by the Army, Navy, Air Force, and Marines called Interservice Procedures for Instructional Systems Development (IPISD).

The phases of this ISD model included analysis, design, development, implementation, and control. The control phase was later renamed evaluation and gave rise to the well-known acronym ADDIE. For a more complete history of ISD, see Molenda and Boling (2007).

The ADDIE Model

ADDIE remains one of the most popular ISD models and continues to be updated and used in many large organizations. Figure 11-1 shows the phases of the ADDIE model. The arrows illustrate the interactive nature of a systems approach.

Each phase of the model is made up of different procedural steps. For example, analysis typically includes needs analysis, learner analysis, context analysis, and content analysis. The output of the analysis phase is learning objectives, which serve as the input to the design phase. For an expansion of basic ADDIE phases into a more detailed procedural guide, see Gagné, Wager, Golas, and Keller (2005).

Figure 11-1. ADDIE Model
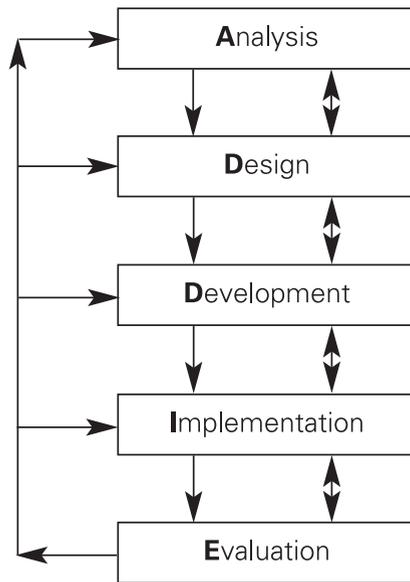
The Dick and Carey Model

Named for its developers, the Dick and Carey model (Figure 11-2) is the most widely known and used ADDIE-type model (Dick, Carey, and Carey, 2014). It is taught in most introductory college and university instructional design courses. Two of its characteristics are particularly noteworthy in our discussion of ISD models.

The model suggests creating assessments for learning objectives *before* designing and developing the instruction. This departure from the basic ADDIE model helps ensure alignment of learning objectives with the evaluation of success in achieving those objectives early in the development process. This sequence often results in an iteration of revising the objectives to better align with how they will be measured.

The Dick and Carey model also places increased emphasis on formative evaluation, or the evaluation of delivery formats and instructional strategies as they are being formed. Revision information gained from early try-outs of the instruction is fed forward in the training development process rather than waiting and facing the possibility of revising an entire program after it has been fully developed.

Figure 11-2. Dick and Carey Model of ISD
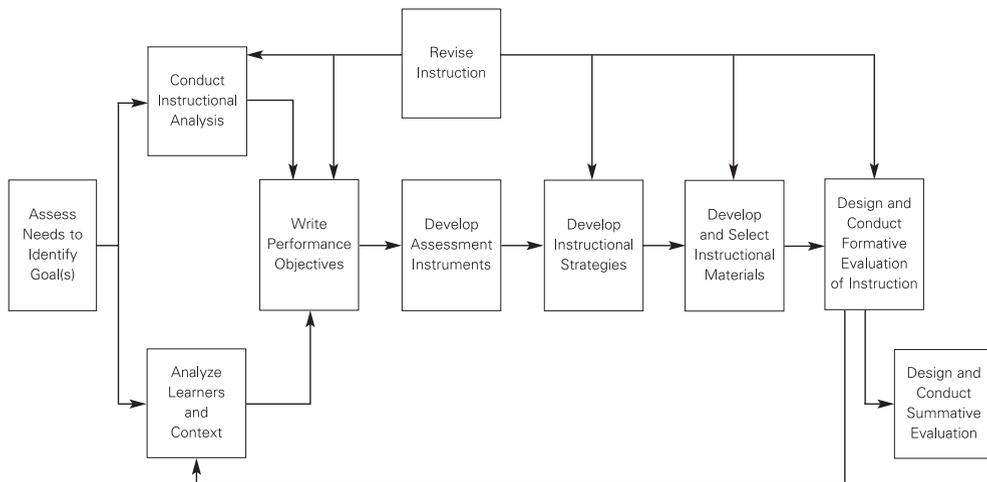
ISD Models, in General

Many ISD models have been developed and used over the last few decades. Models differ in terms of the number of steps, the names of the steps, and the recommended sequence of functions. Gustafson and Branch's (1997) *Survey of Instructional Development Models* includes 18 models. Their list is not intended to be exhaustive; rather it illustrates the various ways of implementing a systems approach.

Organizations typically use their own uniquely customized ISD model, often adapting or combining concepts from other models.

Expanding Models to Meet Current Delivery Systems

When an organization chooses a particular medium or delivery system, it is often necessary to expand, modify, and combine instructional design models with other models and considerations. Figure 11-3 shows one such adaptation for teaching e-learning training development (Sink, 2002).

The first part of the model depicts the basics of ISD, beginning with needs analysis to determine workforce training needs and matching solutions. If analysis confirms some sort of training is needed, the front-end analysis continues with audience, context, and content

considerations. The results of these analyses enable a decision about whether e-learning is an appropriate delivery system choice.

Next, the model expands into three distinct paths that function simultaneously. The three paths are a programming model, an ISD model, and a model for project management. The programming portion of the model is needed to guide of the online learning content. An ISD model is needed to guide instructional program development. A model to guide project management is also needed due to increased project management responsibilities given the complexities of a delivery system that may involve so many different media, software programming, user-interface testing, and learning design strategies. Fairly large design and development teams may be required to provide all the different types of expertise needed.

The instructional design path in Figure 11-3 illustrates the basic components of a typical instructional design process. Additionally, the three-path model shows how and where the programming path and the instructional design or development path interact, and the checkpoints for project management and evaluation.

All these ISD models provide a road map or process for a systems approach with the goal of training outcomes that are results oriented. ISD models systematically strive to deliver the results individuals and organizations need and desire.
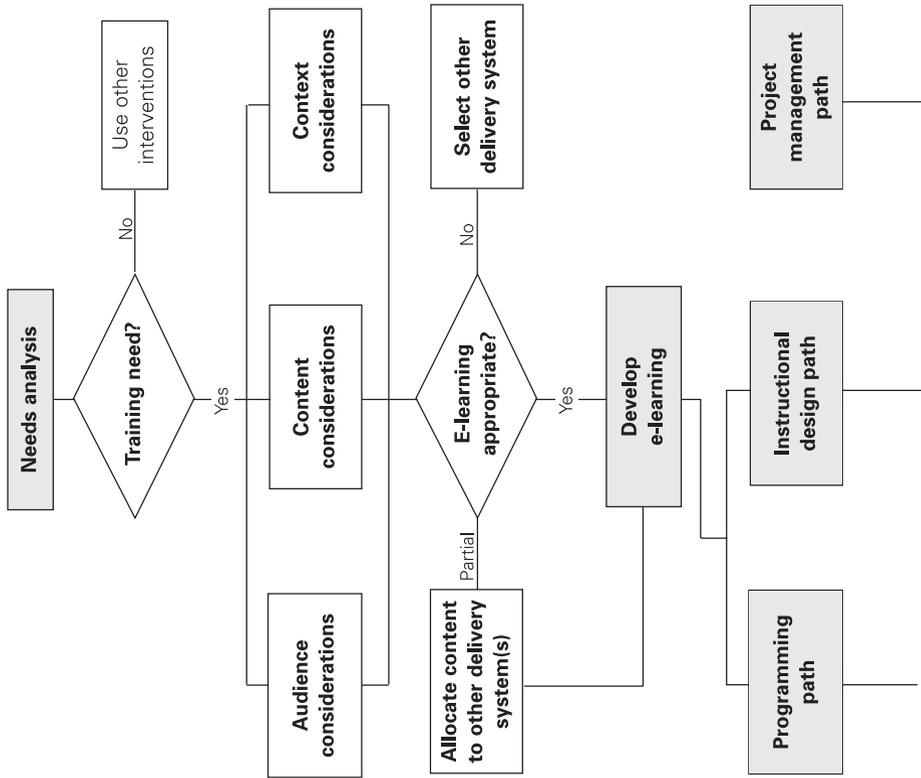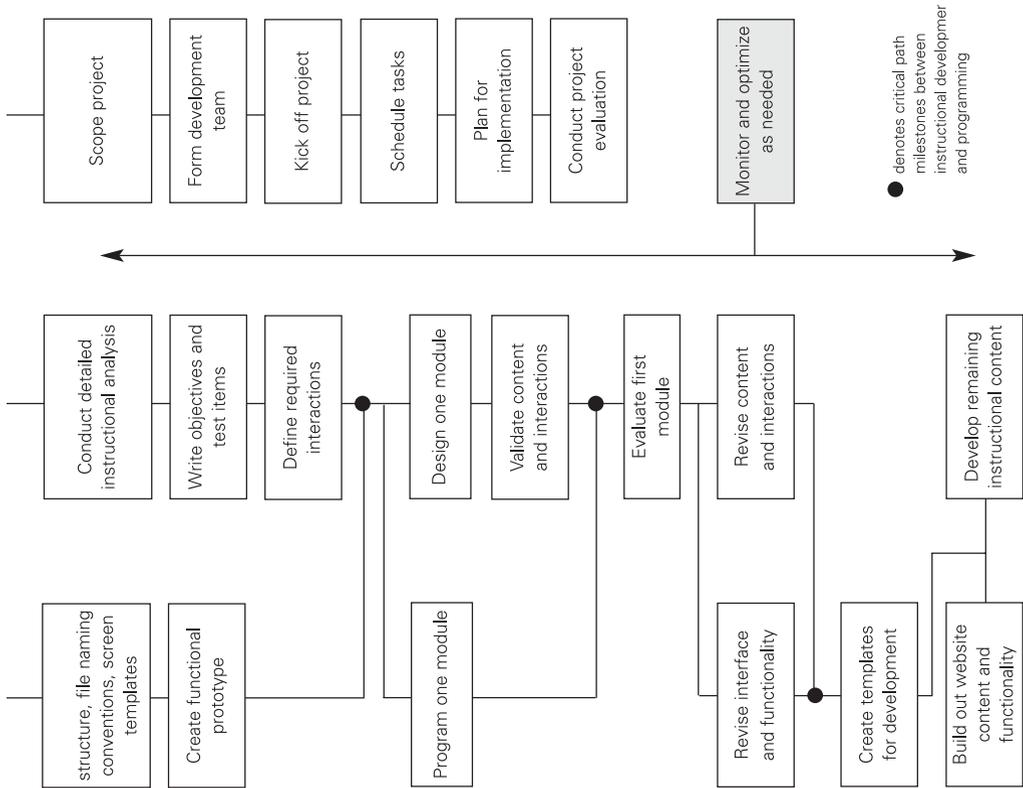
Learning Theories

Learning theories attempt to describe what is going on when people learn. Gagné (1997) puts it this way:

> *[Learning theories] try to provide conceptual structures involved in the process of taking in information and getting it transformed so that it is stored in long term memory and later recalled as an observable human performance. This entire process, or set of processes, forms the basis of what I refer to when I speak of learning theory.*

Learning theories give rise to learning strategies, tactics, experiences, and learning environments that support theory. Given the ISD models, instructional designers make the most use of learning theories and their resulting learning strategies in the design phase (see Figure 11-4).

Figure 11-3. ISD for E-Learning

Scope project

Form development team

Kick off project

Schedule tasks

Plan for implementation

Conduct project evaluation

Monitor and optimize as needed

● denotes critical path milestones between instructional developer and programming

Conduct detailed instructional analysis

Write objectives and test items

Define required interactions

Design one module

Validate content and interactions

Evaluate first module

Revise content and interactions

Develop remaining instructional content

structure, file naming conventions, screen templates

Create functional prototype

Program one module

Revise interface and functionality

Create templates for development

Build out website content and functionality

Figure 11-4. ADDIE Model and Learning Theories
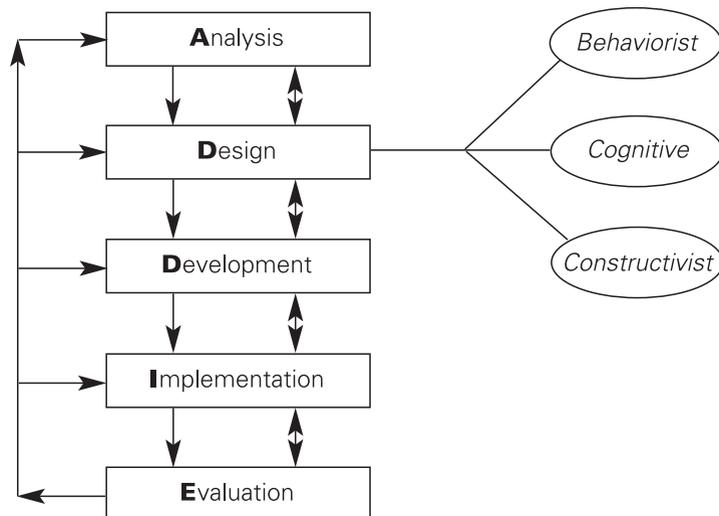
The different ways training courses may be structured and designed (as well as the structure and design of individual lessons, modules, or units of instruction in the course) usually have their origins in one or more learning theories (Molenda and Russell, 2005). The design phase of ISD has been heavily influenced by the behaviorist, cognitive, and constructivist learning theories.

Behaviorist Approach

Behaviorists concentrate their efforts on what is observable learner behavior and reinforcement. Drawing on the research and theories of B.F. Skinner on stimulus-response learning, behaviorist training programs focus on observable behavior. Main tasks are broken down into smaller tasks, and each small task is treated as a separate learning objective. Input and practice, followed by reinforcement (positive or corrective), are the base components of the behaviorist approach.

Behaviorist learning theory gave rise to teaching machines and programmed instruction, from which many practical and essential instructional design concepts are derived. Examples include:

- determining specifically stated descriptions of observable human performance (the objectives of the instruction)
- using objective-based testing rather than topic-based testing (later called criterion-referenced testing)
- using developmental testing of training material prototypes and approaches on members of the target learning populations for the purpose of improving the materials until learners can meet the preset criterion (a try-out and revision process)
- chunking instruction and designing and writing based on learning objectives and content types such as facts, procedures, concepts, processes, and principles.

Current Uses of the Behaviorist Approach

A behaviorist approach is useful in training that is intended to impart intellectual, psychomotor, and interpersonal knowledge and skills (that is, where the learner needs to gain fluency and automatic use of the knowledge and skills). A few examples will clarify the usefulness of this approach:

- Example 1: Teaching learners how to write user requirements for software development illustrates an instance when an intellectual skill should be practiced until learners can write user requirements in the context of their own work environments.
- Example 2: Teaching interpersonal skills related to conflict resolution requires repeated practice with feedback until learners gain enough confidence to use the skills in their own work environments.
- Example 3: Learning to drive a car is a psychomotor skill that must be practiced until certain sub-skills become automatic. Acquisition of automatic sub-skills enables learners to successfully drive without consciously focusing on each and every step in the procedure.

Another offshoot of the behaviorist approach was the research and development in the area of programmed instruction, which reached its peak in the 1970s. Instructional content was presented as prescribed in behaviorist instructional theory: in small chunks, followed by an interactive question or an activity to elicit a response from the learner, and concluded with corrective or confirming feedback.

Benjamin Bloom's (1968) philosophy and concepts revolving around *Learning for Mastery* also have their roots in the behaviorist approach. The learning for mastery model is based on Bloom's premise that perhaps 95 percent of the learner population can learn what we have to teach them and that it is our responsibility as designers and educators or trainers to figure

out the means to help those learners master the content we have to teach. In particular, learning for mastery makes use of performance or behaviorally stated learning objectives and criterion-referenced testing. It also emphasizes diagnostic testing and remediation strategies. *Learning for Mastery* has been influential in public education and in military training.

Robert Gagné

As one of the founding fathers in the field of instructional design, Robert Gagné developed nine conditions of learning, which are instructional events that should be used in every complete act of learning. The conditions of learning are:

1. Gain the learners' attention.
2. Share the objectives of the session.
3. Ask learners to recall prior learning.
4. Deliver the content.
5. Use methods to enhance understanding, for example, case studies, examples, and figures.
6. Provide an opportunity to practice.
7. Provide feedback.
8. Assess performance.
9. Provide job aids or references to ensure transfer to the job.

Gagné was also instrumental in transferring his concepts of instructional theory to computer-based training design and multimedia-based learning.

Gagné was professor emeritus of educational research at Florida State University, where he played a leading role in the establishment and initial operation of the graduate program in instructional systems design. He was also director of research of the American Institutes for Research, where he supervised research programs on human performance, instructional methods, and educational objectives design.

Cognitive Learning Theory

While behaviorist learning theory is focused almost exclusively on external events and processes, cognitive theories focus on what is happening to learners internally. Cognitive learning theories try to understand understanding (Clark, 1999).

The cognitive approach has contributed what we know about internal cognitive processes to the field of instructional design. Cognitive theory helps us provide conditions that make it more likely that learners will acquire the thinking strategies necessary to improve their job performance. The cognitive view of how learning takes place is based on how information is processed, stored, and retrieved in the mind, rather than on how behavior changes (Foshay, Silber, and Stelnicki, 2003).

Cognitive approaches to training have given rise to in-depth strategies and tactics for helping learners acquire cognitive skills. Gagné's nine events of instruction (in the sidebar) are foundational for many cognitive training designs.

The cognitive training procedure suggested by Foshay, Silber, and Stelnicki (2003) juxtaposes the five tasks learners have to accomplish with the elements trainers and designers must put into lessons. Table 11-1 shows lesson elements associated with each of the five learner tasks consistent with the cognitive approach.

Current Uses of Cognitive Theory

The cognitive approach is well suited to helping learners recall new information, comprehend how things work, and remember and use new procedures (Davis and Davis, 1998). It applies generally to objectives in the cognitive domain, particularly to tasks at the lower and middle levels of complexity.

Instructional designers can use learning strategies and tactics from cognitive theory to build on the behavioral approach, thereby expanding their repertoire of strategies and tactics for how people acquire and learn cognitive skills.

Constructivist Learning Theory

Constructivist pedagogy emerged in the 1980s. It revolves around the notion that "knowledge is constructed by the learners as they attempt to make sense of their experiences" (Driscoll, 2000). Constructivist theory sees learning as knowledge construction and is based on the idea that learning occurs when a learner actively constructs a knowledge representation in working memory. According to the knowledge construction view, the learner is a sense maker; the teacher is a cognitive guide who provides guidance and modeling on authentic learning tasks (Mayer, 1999).

The constructivist learning experience is more discovery oriented, rather than expository oriented. Constructivist learning experiences involve carefully crafted activities, multiple perspectives, and learner-driven knowledge creation. These techniques result in tasks similar to those learners would encounter in the real world, with the natural complexities that surround those tasks.

With constructivist strategies, the aim is to make the learning experience reflect real-world experiences, enabling learners to transfer what they learn more efficiently and effectively to their jobs.

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Table 11-1. Cognitive Training Model

Learners Must Do This to Learn	Trainers Put These Elements in Lessons to Help Learners
1. **Select the Information to Attend To.** Heighten their attention and focus it on the new knowledge being taught because that new knowledge is seen as important and as something that can be learned.	**Attention.** Gain and focus learners' attention on the new knowledge. **WIIFM.** Answer "What's in it for me?" for the learners. **YCDI.** Tell the learners "You can do it" regarding learning the new knowledge.
2. **Link the New Information With Existing Knowledge.** Put the new knowledge in an existing framework by recalling existing or old knowledge related to the new and linking the new knowledge to the old.	**Recall.** Bring to the forefront the prerequisite existing (old) knowledge that forms the base on which the new knowledge is built. **Relate.** Show similarities or differences between the new knowledge and old knowledge, so that the new knowledge is tied to the old.
3. **Organize the Information.** Organize new knowledge in a way that matches the organization of related existing knowledge to make it easier to learn, cut mental processing time, minimize confusion, and stress only relevant information.	**Structure of Content.** Present the boundaries and structure of the new knowledge in a format that best represents the way the new knowledge itself is structured. **Objectives.** Specify both the desired behavior and the knowledge to be learned. **Chunking.** Organize and limit the amount of new knowledge presented to match human information processing capacity. **Text Layout.** Organize text presentation to help learners organize new knowledge. **Illustrations.** Use well-designed illustrations to assist learners' organization and assimilation of new knowledge.
4. **Assimilate the New Knowledge Into Existing Knowledge.** Integrate the new knowledge into the old knowledge so they combine to produce a new unified, expanded, and reorganized set of knowledge.	**Present New Knowledge.** Using a different approach for each type of knowledge, present the new knowledge in a way that makes it easiest to understand. **Present Examples.** Demonstrate real-life examples of how the new knowledge works when it is applied.
5. **Strengthen the New Knowledge in Memory.** Strengthen the new knowledge so that it will be remembered and can be brought to bear in future job and learning situations.	**Practice.** Involve learners by having them do something with the new knowledge. **Feedback.** Let learners know how well they've done in using the new knowledge, what problems they're having, and why. **Summary.** Present the structure of content again, including the entire structure of knowledge. **Test.** Have learners use the new knowledge again, this time to prove to themselves, you, and their employer that they have met the objectives of the training. **On-the-Job Application.** Have learners use new knowledge in a structured way on the job to ensure they "use it, not lose it."

Current Uses of Constructivist Learning Theory

Constructivist pedagogy is now combined with the concept of performance-based training and has various names. Models that embrace performance-based training include problem-based learning (Nelson, 1999), goal-based scenarios (Schank, Berman, and MacPherson, 1999), and constructivist learning environments (Jonassen, 1999). In more general discussions, constructivist performance-based learning may be referred to as situated learning, authentic activities, or cognitive apprenticeship. Whatever name is used, the approach describes a learning experience that:

- has real-world relevance
- requires learners to define tasks and subtasks to complete activities
- enables learners to examine tasks and their deliverables from different perspectives
- provides the opportunity to collaborate
- allows for competing solutions and a variety of outcomes
- aims to create polished products or job-related tools valuable in their own right (Reeves, Herrington, and Oliver, 2002).

Adult Learning Theory

Adult learning theory and principles fit, according to our model, between the learning theories and the selection of macro or micro methods of instruction (see Figure 11-5). This sequence is suggested because the three learning theories described earlier are primary, as they apply to everyone. Once primary learning theories are considered, we can adjust our thinking more about selecting macro- and micro-level instructional strategies by considering adult learning theory.

Adult learning theory seeks to explain the concepts and differences of pedagogical and anagogical theories. Pedagogy is the art and science of teaching children. In its extreme, it assigns full responsibility to the instructor or teacher for making all decisions about what will be learned, how it will be learned, when it will be learned, and if it has been learned. It is instructor or teacher directed, leaving the learner only the submissive role of following the teacher's instructions.

In contrast, the andragogy model assumes that adults come to a learning situation with a greater volume and a different quality of experience than youths. These differences in experience then affect or should affect our strategies, instructional and otherwise, to facilitate learning for adults.

Malcolm Knowles (1990) identifies six principles of adult learning:

1. Adult learners *need to know* why they should learn something.
2. The learner's *self-concept*. Adults are internally motivated and self-directed.
3. The role of the learner's *experience*. Adult learners bring a wealth of experience to the learning situation.
4. *Readiness* to learn. Adults are most ready to learn those things that will help them right now or in the near future.
5. *Orientation* to learning. Adults are life-centered (or task-centered or problem-centered) in their orientation to learning.
6. *Motivation*. Adults are more internally motivated (chance for increased job satisfaction, self-esteem, or quality of life, and so on).

For instructional design and delivery suggestions related to these adult learning principles, see pages 35–48 of Elaine Biech's (2009) *10 Steps to Successful Training*. Also see the *Handbook's* website at www.astdhandbook.org for a checklist of sample strategies that the designer and instructor or facilitator may choose from depending on their learning outcomes and situation.

Figure 11-5. ISD Models, Learning Theories, Adult Learning Principles, Strategies, and Lesson Design
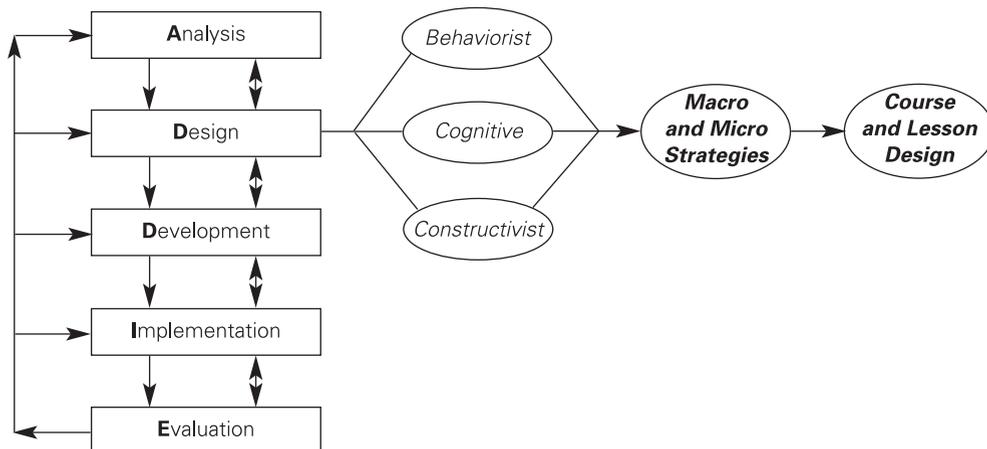
In conclusion, it is important to note that with adults, the *situation* still helps define our approach and strategies. Realistically, some situations may require a more pedagogical approach, at least at first. These include situations in which the learners may lack any experience or knowledge of the subject or job they are learning. In these situations, more directed approaches may be more appropriate.

An Eclectic Approach

Experienced instructional designers frequently take an eclectic approach when designing and developing training programs (see Honebein and Sink, 2012). One learning theory and its related strategies may dominate a particular course, but other theories and strategies may also be used in that same course. This diverse and flexible approach is usually more sensitive to the type and variety of content being taught, the learners, the context, and the results desired.

Figure 11-5 shows the connection among an instructional system design (in this case, AD-DIE), the three leading learning theories, adult learning principles, learning strategies, and course design. The design provides the plan, and the learning theories and adult learning principles help instructional designers come up with plausible instructional strategies and tactics, which lead to course and lesson design.

Instructional designers and trainers can expand their approach to designing instruction by learning to pick and choose the strategies that work best for specific learning situations and goals (Reigeluth and Carr-Chellman, 2009). For example, in a course for IT professionals called "Gathering User Requirements," the overall approach was constructivist. The first day of the course, however, was dedicated to writing and validating good user requirements. This portion of the training used a more behavioral approach of intensive practice and feedback relative to the writing and identification of good user requirements. The course then shifted to constructivist approaches throughout a two-and-a-half day simulation, including readings relevant to the simulation and just-in-time interactive lectures (which also included practice and feedback). Each morning, learners received advanced organizers to clarify the mental schema for the day's learning experience. In addition, thought-provoking instructional games and JOLTS (short experiences to help learners think outside the box, from Thiagarajan and Tagliati, 2011) reinforced key processes and concepts.

Crafting a design that used strategies and tactics from different learning theories and adult learning principles ensured appropriate instruction while offering a variety of experiences that stimulated learners' full engagement in the training program.

Summary

Learning theories describe what's going on when people learn, which influences the ways that a learning designer approaches the design phase of ISD. Three learning theories are especially important in the context of learning design: behaviorism, cognitivism, and constructivism.

The behaviorist view focuses on observable behavior and suggests that learning occurs when a learner strengthens or weakens an association between a stimulus and a response. Thus, the theory influences learning design through the use of learning objectives, objective-based testing, and information chunking.

Cognitivism focuses on knowledge acquisition and is based on the idea that learning occurs when a learner places information in long-term memory. Learning designs that emphasize this theory consider how information is processed, stored, and retrieved in the mind, and frequently follow Gagné's nine events of instruction.

Finally, the constructivist view considers learning to be knowledge construction and is based on the idea that learning occurs when a learner actively constructs a knowledge representation in working memory. Thus, a constructivist learning design stresses activities that will enable learners to discover knowledge for themselves.

Adult learning principles must be applied also and must serve as an umbrella-like concept making the whole learning environment and experience work better for adult learners.

All three learning theories combined with adult learning principles have their strengths, depending on business and learner needs, which argues for an eclectic approach to instructional design. This is where instructional design professionals select best practices from all three theories; apply the best strategies based on the desired results; and create learning experiences that effectively meet organizational, business, and individual needs.

About the Author

Darryl L. Sink, EdD, is president of Darryl L. Sink and Associates (DSA). DSA has 32 years of experience designing and developing great learning experiences. His firm specializes in learning and performance consulting and custom training design and development. His graduate work was at Indiana University in Bloomington, where he specialized in

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