

Instruction as an Intervention

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Although instruction is only one of many possible performance interventions it is one of the most valuable, flexible, and frequently used. This chapter begins by placing instruction into the larger context of performance improvement. Next, it provides guides to planning instruction, with emphasis on selecting an appropriate lesson framework and then selecting appropriate methods and media within that framework. It also provides data on how different forms of instruction are being implemented currently in the workplace. It concludes with an overview of assessing learner outcomes and evaluating the impact of instruction.

INSTRUCTION AIMS AT IMPROVING CAPABILITIES

Instruction is a generic term referring to any effort to stimulate learning by the deliberate arrangement of conditions and experiences. Instruction is often viewed as covering a spectrum of efforts, ranging from very narrow in scope to very broad in scope and with purposes ranging from immediate application in the workplace to general personal development. Some advocate labeling the ends of the spectrum as training and education. Stolovitch and Keeps (2002) refer to the aim of *training* as equipping learners to “consistently reproduce without variation” (p. 10). Figure skating, keyboarding, assembling a rifle, and remembering the multiplication tables are the sorts of repetitious, even mechanical, abilities that they would consider the subjects of training. They define *education*, on the other end of the spectrum, as efforts to achieve the broader goal of developing generalized abilities with underlying mental models and value systems. Leading project teams, responding flexibly to customer needs, and devising strategic plans are the sorts of complex abilities that could be viewed as goals of education. However, such distinctions are somewhat arbitrary, and both training and education can take place in either the workplace or in formal education institutions. The more generic term, instruction, encompasses the whole range of types and so it is used here as a common denominator that can be used in different sectors to refer to the whole range of learning interventions.

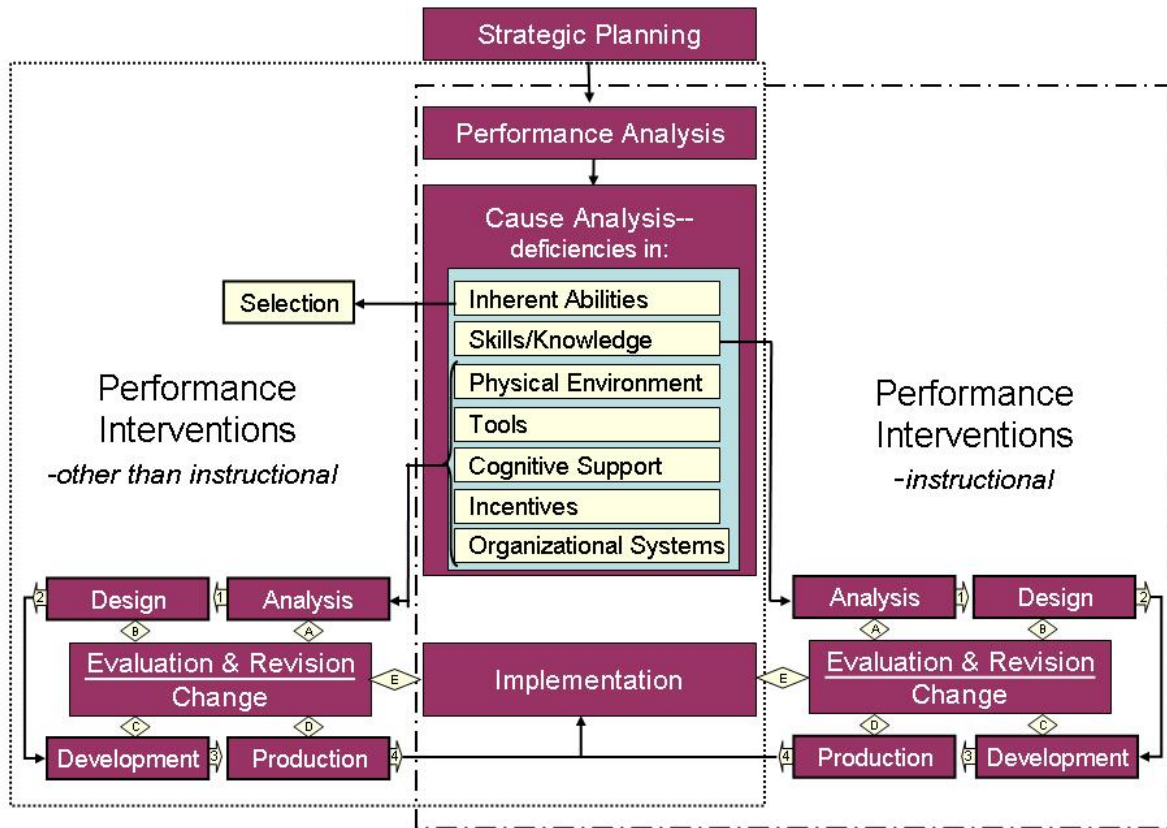
The critical attribute of instruction is that it is directed at facilitating *learning*. Learning is defined as a persisting or quasi-permanent change in capability resulting from the learner’s experience and interaction with the world (Driscoll 2000). Instruction, therefore, has as its goal a lasting change in capability. This is a crucial point in distinguishing instruction from merely providing information.

Instruction can be defined as the arrangement of purposive and controlled events that lead to the achievement of some learning goal. The learning goal can range from recalling information, to comprehending and applying principles, to attaining mastery of physical skills, to new attitudes, or many other types of outcomes, as is discussed later.

Instruction is one of Many Performance Interventions

Training does not take place in a vacuum, but some training professionals behave as though it does. The corporate training literature tends to place learning, instead of performance, at the center of the universe, ignoring the impact of the many environmental factors surrounding performance in the workplace. Some involved in business consulting began to see the larger picture more clearly in the 1970s as they saw instruction-only solutions fail to have lasting effect on persistent business problems. The view began to emerge that instruction alone seldom was sufficient to enable people to become effective achievers, in society or in the workplace. Over time, a new perspective emerged that the goal should be the improvement of human performance, which could best be accomplished by combining instructional interventions with non-instructional interventions, such as enhanced incentives, better tools, job aids, more supportive organizational structures, and so on.

This handbook is based on this newer view, the human performance technology perspective. One way of depicting this approach is through a visual model developed by Molenda and Pershing (2004), shown in Figure 1.



Strategic Impact Model

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The major theme of the Strategic Impact Model is that instruction alone seldom solves performance problems. Almost all performance problems are rooted in more than one cause, and although training or education may be part of the solution, other interventions, such as job redesign, incentive adjustments, job aids, better tools, or the like, are invariably required to make the instruction pay off. Instruction comes into play when people's performance is inhibited by the lack of needed knowledge or skills.

The model shows explicitly how instructional interventions and other sorts of performance interventions relate to each other, springing from a common performance analysis and converging in a common implementation phase. The model specifies an array of performance interventions, of which instruction is one. It incorporates the typology developed by Wile (1996) specifying seven sources of performance shortfalls: 1) inherent abilities, 2) skills/knowledge, 3) physical environment, 4) tools, 5) cognitive support, 6) incentives, and 7) organizational systems. This typology proposes that people fail to perform adequately in the workplace when they 1) lack the basic qualifications, such as intelligence, strength, speed, to do the job; 2) lack the specific knowledge, skills, or attitudes; 3) are given

surroundings that are detrimental to good work: hot, noisy, crowded, unsafe, poor ergonomics, and so on; 4) don't have proper tools to do the job: obsolete machines, clumsy computer systems with faulty software, and so on; 5) lack job aids or electronic help systems that can provide information as needed; 6) have insufficient incentives: money, benefits, recognition, advancement opportunities, and so on; 7) or struggle in an organizational structure with poor communication, weak leadership, oppressive supervision, and the like...or some combination of two or more deficiencies.

The point is to constantly keep in mind that instruction is the solution to only one type of problem, the problem of lack of the sorts of knowledge and skills that can be learned. In many cases, people know how to do something but do not have the incentives to do it. Or they have the knowledge and incentives but do not have the tools to do the job well. Training will not give them the motivation or the tools.

Although instruction is just one tool among many in the performance improvement toolbox it is an extremely vital one. When addressing business problems or opportunities, the capabilities of the workforce are often the most important component, so training or education are frequently the keystones of the change process. Even when other interventions are at the center of a change, there is almost always some need for training or education to support those other interventions. For example, if the word-processing system is upgraded, implementing a tool intervention, the users will need some orientation to and practice on the new hardware or software, which would be an instructional intervention. Or in a shift from individual to team-based operation, which would be an organizational system intervention, supervisors will need extensive reorientation of their skills and values, which would be an education-type intervention.

Distinguishing Information-Giving from Instruction

Information consists of facts, news, comments, and similar representations of knowledge. Receivers are not responsible for measurable, specific actions or performance as a result of being presented with information. Often the presentation, which may be live, printed, or on the Internet, is general in content and its purpose is to give an overview of ideas or subject matter: to generate interest, to provide background information, or to give procedural details. Information can be presented in a memo, in the classroom, in the textbook, or on the Web.

Giving information, the presentation of content, is much different from and less than instruction, the arrangement of information and events to facilitate learning. In other words, "telling ain't training" (Stolovitch & Keeps, 2002). Trainees should not be expected to be responsible for the retention or use of information they have only seen or heard. Meaningful understanding, retention, and use require instructional activities, including practice with feedback. Active engagement with the material by questioning it, discussing it, applying it to practice problems, is the critical component of instruction.

And, of course, there should be assessment to determine whether the trainees have mastered the objectives.

Distinguishing Cognitive Support from Instruction

It is easy to lose sight of the differences between two related interventions, cognitive support and instruction. Both deal with mental operations, and both may entail some presentation of information. In some cases, cognitive support can substitute for and complement instruction, but they are not equivalent.

An example can be found in the digital work environments, where people are near computer screens as they work. The computer system makes it possible to give them electronic Help systems to provide advice as needed. The most common example is the Help button built into most word processing programs. If you don't know how to change the margins on a page you can click on the Help button, type in some key words, and receive specific advice on how to do it.

Besides computer Help systems, cognitive support is provided by other sorts of job aids, which can take many forms (Rossett & Gautier-Downes, 1991). A telephone directory saves you from having to memorize every phone number you might ever need. Tables in the back of statistics textbooks provide sequences of random numbers and charts to determine levels of significance. Nearly every appliance comes with a booklet of operating procedures; the power lawn mower has the most critical operation rules inscribed on the handle. Decision-tree charts can quickly help decide if an applicant qualifies for disability payments under Social Security.

There is a real distinction between mere cognitive support and instruction. The information provided by the job aid is not meant to be memorized. It is assumed that the user will look up the information on the rare occasions that it is needed. On the other hand, instruction is meant to lead to learning, a quasi-permanent change in capability. However, with computers, it has become possible to give ever more rapid and detailed advice in specific problem situations, to the point that the computer could be said to be coaching the user. This can lead into a grey area between telling and training. That is, with consistent use, the user could gradually internalize the advice of the Help system, remembering more and more of the information provided. At this point the Help system may be contributing to learning although its aim is only to provide just-in-time assistance.

In the future, the line between cognitive support and instruction will be further blurred by the trend toward work-embedded training, instruction that occurs at the work site. Employers are increasingly reluctant to take workers off the job for training, especially since there is a lot of evidence that the training that transfers to the job is the training that most closely resembles working conditions. Transfer-of-training increases as the practice is more realistic. So cognitive support may take on more and more of the traits of training, what some refer to as just-in-time training, and training may incorporate more and more

cognitive supports, especially in the form of electronic performance support systems, such as Help systems.

PLANNING INSTRUCTION

There are two broad types of guides to the preparation of effective, appealing instruction. First, there are instructional design/development models, procedural guides that focus on the steps to be followed by the planners as they proceed from conceptualizing the problem to evaluating the success of the intervention. Such models attempt to specify what decisions need to be made and in what order. Models that follow the systems approach generally recommend the sequence of analyze, design, develop, implement, and evaluate. Based on this sequence, the acronym ADDIE is often used to refer to this family of models.

Second, there are lesson frameworks or templates for the structure of instructional units, which might be referred to as a lesson, unit, module, program, or other term. These frameworks specify the nature and sequence of learning activities that should be incorporated into any effective lesson. A familiar example is the Events of Instruction framework (Gagne & Medsker, 1996). Such lesson frameworks are vitally useful during the design stage, when planners are deciding how to structure the lesson or series of lessons. Particular lesson frameworks are better suited to particular sorts of objectives, so the team's choice may be guided by the types of outcomes that are being pursued.

Instructional Design/Development Models

In the world of formal education, teachers usually plan their own lessons, select or develop the instructional materials, conduct the classroom activities, assign and grade practice exercises, and develop and administer the tests. Their planning processes tend to be informal and pragmatic.

On the other hand, in business, military, and other large organizations, instructional processes are often allotted to different specialists: managers and supervisors decide on training needs, analysts conduct surveys and observations, designers create lesson blueprints and tests, production specialists create materials, trainers conduct the lessons, and evaluators measure the results. Coordinating the whole process may be a small team headed by an instructional design/development specialist.

Further, organizations other than formal education institutions tend to place a higher value on efficiency and efficacy. Instruction must accomplish its goals for the organization to survive. To do this, instructional planning procedures must be efficient and their results must be demonstrable. In complex organizations with many units and even multiple sites there must be a standardized process for carrying out instructional planning, to avoid expensive waste and duplication of effort. Thus, in organizational

settings managers and training specialists prefer instructional design/development processes that follow a systems approach.

Systems Approach Models

The essence of the systems approach is to break the instructional planning process into small steps, to arrange the steps in logical order, then to use the output of each step as the input of the next. At the most general level, most planners agree that the major stages are analysis, design, development, implementation, and evaluation. Therefore, the outputs of the analysis stage, a description of the learners, the tasks to be learned, and a listing of the instructional objectives to met, serves as input to the design stage, where those descriptions and objectives are transformed into specifications or a blueprint for the lesson. Next, the design specifications serve as inputs to the development stage, where they are used to construct the materials and activities of the lesson. In the implementation stage the instructors, materials, activities, and learners come together to use the products of the development stage. Finally, those instructional activities are evaluated to determine if the original objectives have been met and whether further instruction is necessary.

Another key attribute of the systems approach is a commitment to conducting evaluation and revision at each step of the design/development process. At each major decision point there is an opportunity to gather data to test that decision and other prior decisions to verify that the project is moving ahead toward a solution of the originally defined problem. If the results of a step are not satisfactory, for example, if a sample group of trainees are confused by the directions in the prototype of a new simulation exercise, then the design step must be repeated, finding ways to clarify the directions. Of course, sometimes it happens that further analysis leads developers to shift the target objectives and continue in a different line. This process of repeating steps until satisfactory results are achieved is referred to as an *iterative* approach. Because of this commitment to evaluation at each phase of the process, the ADDIE label is a bit of a misnomer. Evaluation is not just conducted at the conclusion of training, but at the conclusion of each phase of development.

Numerous systems approach models have been proposed. They differ in terms of the number of steps, the names of the steps, and the recommended sequence of functions. Gustafson and Branch's *Survey of Instructional Development Models* (1997) includes 18 models. Their list is not intended to be exhaustive, but illustrative of the various ways of implementing a systems approach. Most organizations use their own home-grown model, often adapting or combining other models to guide their design/development activities.

The major steps of the systems approach are shown in Figure 2.

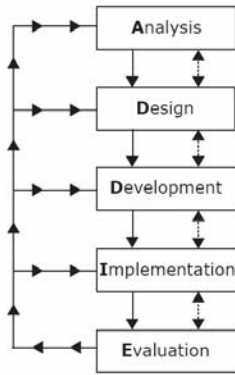


Figure 2. The major elements of the systems approach to instructional design and development, also known as “the ADDIE model”

Gagne, Wager, Golas, and Keller (2005) provide an expansion of these basic steps into a more detailed procedural guide:

I. Analysis

- a. First determine the needs for which instruction is the solution.
- b. Conduct an instructional analysis to determine the target cognitive, affective, and motor skill goals for the course.
- c. Determine what skills the entering learners are expected to have, and which will impact learning in the course.
- d. Analyze the time available and how much might be accomplished in that period of time. Some authors also recommend an analysis of the context and the resources available.

II. Design

- a. Translate course goals into overall performance outcomes, and major objectives for each unit of the course.
- b. Determine the instructional topics or units to be covered, and how much time will be spent on each.
- c. Sequence the units with regard to the course objectives.
- d. Flesh out the units of instruction, identifying the major objectives to be achieved during each unit.
- e. Define lessons and learning activities for each unit.
- f. Develop specifications for assessment of what students have learned.

III. Development

- a. Make decisions regarding the types of learning activities and materials.
- b. Prepare draft materials and/or activities.

- c. Try out materials and activities with target audience members.
- d. Revise, refine, and produce materials and activities.
- e. Produce instructor training or adjunct materials.

IV. Implement

- a. Market materials for adoption by instructors and potential learners.
- b. Provide help or support as needed.

V. Evaluate

- a. Implement plans for learner assessment.
- b. Implement plans for program evaluation.
- c. Implement plans for course maintenance and revision.

(p. 22)

The Dick and Carey Model. The most widely known and used ADDIE-type model is the one developed by Dick, Carey, and Carey (2005), shown in Figure 3.

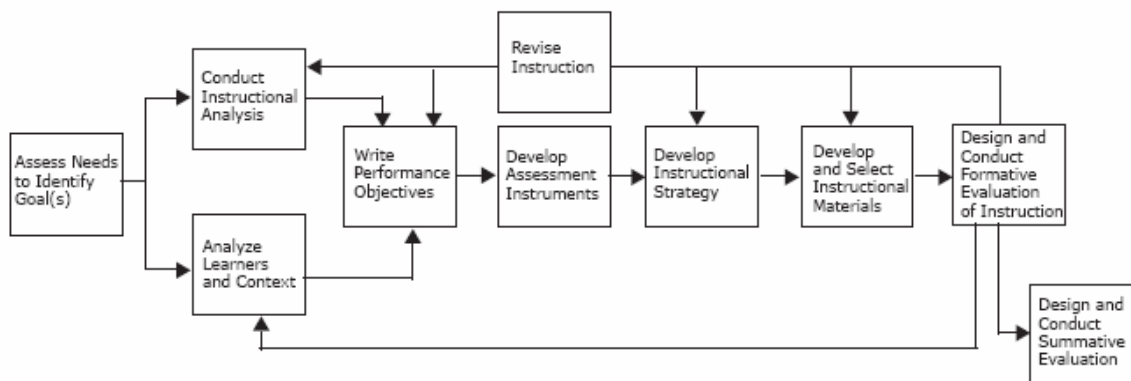


Figure 3. The Dick and Carey Model of ISD

It is taught in most introductory courses at colleges and universities, it has been widely adopted, and it serves as the basis for other models. The model is typical of the overall planning process for instructional interventions in business, industry, government, and military training.

The Dick and Carey model begins with needs assessment to determine whether there is an ignorance problem to begin with. It then recommends analyzing the instructional content, the learners, the instructional context, and the context in which the skills will be applied. The initial analysis leads to the specification of objectives. A unique aspect of the Dick and Carey model is that it then recommends specifying the assessment instruments and methods aligned with those objectives, prior to designing the instruction. Their concept is that if the developers can be clear enough about what and how they will be

testing, they have a much better idea of what instructional strategies to select in the next step. After developing the instructional materials and procedures to implement the strategy, the model wraps up with evaluation and revision. It recommends first a formative evaluation of the instruction, small scale testing of the early drafts of the lesson elements followed by revision. Then a summative evaluation is conducted at the end of the actual lesson, to determine whether the lesson achieved the expected learning results.

In the Dick and Carey model and other similar models the central focus is on the Design phase, creating or selecting the methods and materials that will comprise the learner's experience. The steps of specifying objectives, selecting methods and media, and deciding on a lesson framework deserve special attention.

Specifying Goals and Objectives

Goals for instruction are typically classified under three broad headings according to the type of learning being pursued: cognitive, affective, and psychomotor. This classification system was proposed in Bloom (1956) and has continued to be the most popular taxonomy. Cognitive refers to intellectual skills, from simple knowledge of facts through complex problem-solving. Affective refers to attitudinal and emotional changes, from the formation of preferences to complex value systems. Psychomotor refers to physical skills, including manual dexterity, athletic skills, and the like; the stem psycho- is included in this term to remind us that many physical skills also entail mental activity. Romiszowski (1981) proposes a fourth category, interpersonal, to cover objectives related to human relations, such as those involved in teamwork, sales, coaching, and supervision.

Sometimes it is difficult to classify a learning goal or objective into just one category because most real-world instructional objectives have cognitive, affective, interpersonal, and psychomotor aspects. It is difficult to conceive of any instructional objective that doesn't have some mental component...or emotional overtone...or observable physical activity. For example, if the goal is to have the learner write a memo in proper format, this does entail the physical act of writing or keyboarding. Nevertheless, the focus is on the mental skill of remembering and applying the proper format, so this would be classified as a cognitive, not psychomotor, objective. Thus instructional objectives are classified according to which category of skill is being emphasized at any given time. Advocates of a systematic approach place great importance on clear specification of objectives at an early stage in the planning process, as the selection of instructional methods is to a great extent dependent on exactly what learning objective is being pursued.

Instructional Methods and Media

During the Design phase, planners have to decide what methods to employ and what media channels to use to carry out the instruction. The term method simply means a way of doing something. An *instructional* method is a way of instructing or a way of involving learners in a particular sort of teaching-learning activity. Instructional methods are defined here as teaching-learning activities distinguished by the pattern of communication among teacher, learner, and different types of materials. For example, a presentation is a one-way information exposition by a teacher, or software substituting for a teacher, to a number of learners. A discussion entails free exchange of information among a group of learners. Instructional methods can be classified into about ten broad families: presentation, demonstration, tutorial, reading, reflection, discussion, expression, construction, drill-and-practice, and discovery/inquiry; these are shown visually in Table 1.

Table 1. Typology of Instructional Methods	
<p>Teaching Methods (teacher-controlled)</p> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; margin: 10px 0; text-align: center;">Presentation</div> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; margin: 10px 0; text-align: center;"> Demonstration (modeling—teacher, peer) </div> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; margin: 10px 0; text-align: center;">Tutorial</div>	<p>Learning Methods (learner-controlled)</p> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; margin: 10px 0; text-align: center;"> Reading (viewing, listening) </div> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; margin: 10px 0; text-align: center;">Reflection</div> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; margin: 10px 0; text-align: center;">Discussion</div>
<div style="border: 1px solid black; border-radius: 50%; padding: 10px; margin: 10px 0; display: inline-block;"> Drill-and-Practice (mental drill, memorization) </div>	
<div style="border: 1px solid black; border-radius: 50%; padding: 10px; margin: 10px 0; display: inline-block;"> Expression (verbal, action) Construction (tangible product) </div>	
<div style="border: 1px solid black; border-radius: 50%; padding: 10px; margin: 10px 0; display: inline-block;"> Discovery/Inquiry <ul style="list-style-type: none"> ▪ Laboratory ▪ Simulation ▪ Game </div>	

Some of these methods are centered on activities controlled by the teacher or instructional system, such as presentations and demonstrations; others are more learner controlled, such as reading, reflection, and discussion; yet others can share or alternate control between teacher and learner, such as drill-and-practice and discovery/inquiry.

Table 2 gives a verbal definition of each category and shows typical formats in which these methods are embodied.

Table 2. Methods, their definitions, and typical formats		
Methods	Definitions	Typical Formats
Presentation	One-way information flow from source (Teacher) to many receivers (Learners) <ul style="list-style-type: none"> • typically verbal • may have visual supplement 	lecture, oral presentation - with display: whiteboard, OH, handout, PowerPoint™ slides film showing radio program television program video clip Statement made via audio or video conference
Demonstration	One-way information flow, featuring realistic “ <i>showing</i> ” rather than “ <i>telling</i> ” <ul style="list-style-type: none"> • may be human or device, T or L • may be planned behavior modeling • may be unconscious modeling 	showing “how to do it” (live, recorded) -teacher demo in music, dance master class -video: sports skills teacher as role model peers as role models
Tutorial	Two-way interchange between T and L <ul style="list-style-type: none"> • L exerts some control • T must be able to respond flexibly 	apprenticeship athletics: coaching music: master class mentoring Socratic dialog structured tutoring branching programmed instruction adaptive CAI teacher-student exchange in Web chat teacher-student exchange via e-mail
Reading	L engages with text / visual material <ul style="list-style-type: none"> • material instructionally encoded • L controls pace 	reading textbooks, modules, handouts reading Web pages, “tutorials” linear programmed instruction or CAI watching video, listening to audio video-streaming on the Web
Reflection	L examines own performance/ thoughts <ul style="list-style-type: none"> • analyzes and may report 	coach-student dialog medical, psych: case conference written -short paper -e-mail to teacher -post-class recap (+, -, ?) evaluative checklist debriefing: post-sim/game or field work “think-aloud” protocol small-group process analysis

Expression	L creates a verbal product or physical performance <ul style="list-style-type: none"> meant to express thought, feeling 	answers to study or quiz questions essay, poem e-mail messages -chat, bulletin board comments performance: dance, speech musical performance or composition
Construction	L creates a tangible product <ul style="list-style-type: none"> not a verbal message meant to express thought, feeling 	multimedia presentation art: painting, sculpture design: drafting, interior décor, lighting, landscape, architectural
Discussion	Two-way interchange among Learners <ul style="list-style-type: none"> T may initiate, monitor, not control 	seminar T-group buzz group debate (for participants) panel discussion reacting to someone's posting in a discussion forum participating in a Web chat participating actively in audio/video conference
Drill-and-Practice	L practices skill repeatedly <ul style="list-style-type: none"> may be internal memorization usually self-paced 	memorization drill language lab athletic practice, drama rehearsal end-of-chapter exercises recitation instructional game -math, reading, spelling drills
Discovery/Inquiry: Laboratory	L acts on <i>real</i> environment, raw materials <ul style="list-style-type: none"> usually self-paced exploration 	science experiment studio -art, drama clinic (diagnosis, problem-solving) field work -archeology, anthropology -student teaching case study (real instances) project
Discovery/Inquiry: Simulation	L acts on <i>artificial</i> environment, materials, characters <ul style="list-style-type: none"> may be group-based 	physical simulator decision-making simulation (policy) social simulation -role play, one-to-one -group interaction (socio-drama) business scenario (simulated case) business game (competitive)
Game	<ul style="list-style-type: none"> Games include artificial rules, a goal, and competition 	

Media can be distinguished from methods. A medium is a channel that carries information between a source and a receiver (Smaldino & Russell, 2005). Today's electronic media are often made up of multiple sets of channels comprising the delivery systems through which messages are sent. Radio programs are broadcast through the air, picked up in radios where their signals are conveyed through a speaker into the air to the listener's ear. Video tapes pass through playback devices, which send the

recorded signals through wires to a TV set or monitor, generating images on a screen, which are scanned by the viewer's eye. These common electronic delivery systems illustrate the sometimes complex chain of senders, receivers, and channels comprising a given medium. Some media are much simpler, such as the human voice traveling through the air to the listener's ear. Whether simple or complex, the media themselves are merely channels through which almost any sorts of messages can be transmitted. They can be used effectively or ineffectively for instruction.

Sometimes people confuse media with methods. For example, the terms e-learning or video-based instruction might be used to purportedly describe what instructional methods are being used. However, although these terms tell you something about what communication channels or media are being used, they tell you very little about what teaching-learning activities or methods are being used.

E-learning simply refers to the use of words, images, and sounds that are filtered through some computer system and displayed on a viewing screen. Learners might interact with the display by clicking or scrolling with a mouse, touching a touch-sensitive screen, or typing on a keyboard. In the most prevalent type of e-learning, the learner simply reads verbal information on a screen, with the interaction limited to clicking on links or possibly on multiple-choice items, leading to more pages of text. In this case, the teaching-learning activity or *method* is simply reading, one of the most commonly used methods.

The Relationships among Methods, Media, and Learning

Although the issue is still debated in instructional technology circles, there is compelling evidence, both from research and from logic, that methods influence learning far more than media do. Clark (2001) convincingly argues this point, pointing to hundreds of media comparison studies and the meta-analyses of those studies. In research studies in which two different media are used to teach the same content, it usually turns out that the winning treatment is the one that uses more effective instructional methods. Even more certainly, when the studies are tightly controlled so that both media treatments use the same instructional methods, then a finding of no significant difference is inevitable.

The choice of medium does make a difference, of course. Different media can have definite cost and time advantages. If you want a thousand sales representatives scattered over 85 cities to participate in an interactive simulation exercise, it will probably be faster and cheaper to distribute the simulation on the Web than to arrange for live, face-to-face meetings, assuming the reps have access to Internet computers at work or home. The medium accounts for the time and cost saving; the instructional method, simulation, accounts for the learning effect.

Certainly, some delivery systems are better suited to incorporate certain methods. A demonstration is easier to communicate by television than radio. A book is better for reading than a computer monitor. Face-to-face interaction is better for discussion than a telephone. But these built-in disadvantages can be overcome with the investment of enough time, money, and ingenuity. A highly

detailed verbal description, with sound effects, can approximate a visual demonstration. With attention to font size and background color, printed material can be read from a TV screen. High quality multi-party discussions can be done by telephone if planned well. With ingenuity, the normal bounds of a medium can be stretched to accommodate methods that are not really well matched with that medium. To do this, though, requires additional effort, creativity, and cost.

On the other hand, the built-in advantages of a medium can be ignored by designers. Consider the use of television to show talking heads or shots of written material; these are not the most powerful instructional methods that television is capable of carrying. Again, media can be used well or poorly; they can incorporate effective or ineffective methods. The secret of *effective* instruction is the selection of methods suited to the particular content and objectives. The secret of *efficient* instruction is the selection of media that can carry the required methods to the largest number of learners at the lowest cost.

Models vs. Lesson Frameworks

There are, of course, other ways of viewing the design of instruction besides the systems approach. Dozens of alternative approaches are described in *Instructional Development Paradigms* (Dills & Romiszowski, 1997). However, most of these approaches actually are closer to lesson frameworks, as described below, than to road maps for the entire instructional planning process. Approaches that attempt to portray the whole process tend to resemble the systems models, although using synonyms for the elements of the process.

Even within the systems approach community, though, some practitioners and researchers feel that many instructional design/development models do not provide sufficiently specific directions on how to actually carry out each step, especially the crucial step of Design—deciding how to construct the lesson (McCombs, 1986; Gordon & Zemke, 2000). Although such steps may not be specified within instructional design/development models there is a related body of knowledge that does provide such guidance. There are a number of well known, tested frameworks around which designers can flesh out the plan for the individual units or lessons.

Lesson Frameworks

A major decision at the Design stage is to select an overall framework for the lesson or other instructional unit. Many different frameworks have been proposed, usually inspired by a particular theory of learning. Theories of learning attempt to describe what is going on as people learn. Deeper understanding of the learning process can suggest ways to shape instruction to fit more naturally with that process, giving rise to new instructional theories and new frameworks for structuring lessons. Four lesson frameworks that are well known and widely applied are explored here in some depth: behaviorist, cognitive, constructivist, and eclectic. Many other frameworks are explained fully in Reigeluth (1983, 1999), Davis & Davis (1998), and Medsker & Holdsworth (2001).

Behaviorist Framework

Theory Base. The first major post-World War II influence on thinking about lesson design was B.F. Skinner's innovation, programmed instruction, which he created to embody the principles of learning that he and others had discovered in the operant conditioning laboratory (Skinner, 1954). Operant conditioning focuses on the observable behavior of the learner and the events that follow the behavior. The theory holds that any behavior that is followed by reinforcing events is more likely to be learned and exhibited in the future. Complex performances can be broken into smaller components and each component can be built up by practice followed by reinforcement.

Application of the Theory. To apply this theory to cognitive abilities, Skinner proposed using a framework called programmed instruction. The programmed instruction framework specified five major elements, according to Schramm (1962): "an ordered sequence of stimulus items; to each of which a student responds in some specified way, his responses being reinforced by immediate knowledge of results, so that he moves by small steps, therefore making few errors and practicing mostly correct responses, from what he knows, by a process of successively closer approximations, toward what he is supposed to learn from the program" (p. 2).

As research and practical experience accumulated, exemplified by Lumsdaine and Glaser (1960) and Glaser (1965), the robustness of many of these specifications came into question. That is, the sequence of experiences, the nature of the response, the timing of feedback, and the size of steps all appeared to be contingent on various learner characteristics and learning conditions. Since the specific formulaic elements of programmed instruction didn't seem to account for its success, developers began to see that the benefit was in the underlying principles. Programmed instruction's specifications were then broadened and simplified by Popham (1971) to four principles: "1. Provide relevant practice for the learner. 2. Provide knowledge of results. 3. Avoid the inclusion of irrelevancies. 4. Make the material interesting" (p. 171).

Instructional Pattern. The behaviorist approach today is characterized by precisely phrased performance objectives and breakdown of the learning task into small steps, each of which can be practiced and corrected until mastery is attained. This pattern can take the form of a self-study module in printed or computer-based form or a face-to-face session conducted by a coach or mentor with an individual learner or small group.

Methods. This approach favors methods that allow learners to progress at their own pace while getting feedback:

- *Reading*, including use of programmed texts, programmed audiovisual modules, and linear computer-assisted instruction (CAI)
- *Tutorial*, including on-the-job apprenticeship, structured tutoring, and adaptive CAI

- *Drill-and-practice*, including language labs, practice exercises embedded in Web lessons, and instructional games
- *Demonstration*, displaying the desired behavior to be learned, most likely in the form of behavior modeling (Bandura, 1969)
- *Discovery/inquiry*, including social simulations, role-play exercises, and computer-based scenarios.

Uses. The behaviorist approach is well suited to skill development of the sort that Stolovitch and Keeps (2002) would place into the domain of training, routine tasks—simple or complex—that must be completed repeatedly with accuracy and efficiency. Intellectual skills of the lower levels, such as discrimination, concept learning, association, and chaining, which is automatically performing a multi-step procedure, have been taught successfully with the behaviorist approach (Ertmer & Newby, 1993, p. 56). Such intellectual tasks are often embedded in a larger procedural skill lesson.

Cognitive Framework

Theory Base. In the decades since the 1960s instruction has been informed increasingly by principles drawn from other sources, especially cognitive psychology. The cognitive approach emphasizes the importance of the learners' mental and emotional processes during the course of instruction. From this perspective, learners use their memory and thought processes to generate strategies as well as store and manipulate mental representations and ideas.

One branch of cognitive theory, information-processing theory, conceives the human learner as a processor of information, similar to a computer. In this view, represented by the work of Atkinson and Schiffrin (1968), sensory inputs are selected, encoded, and stored in short-term and possibly long-term memory. Later, well-stored information may be retrieved and used.

Another branch, assimilation theory, focuses on the human learner's cognitive structure and the processes whereby new information is integrated into the overall structure. Ausubel's schema theory (1980) views schemata as providing mental scaffolding, containing slots that can be filled in with particular cases. These schemata allow learners to organize information into meaningful units. This theory implies that the learner's cognitive structure at the time of learning is the most important factor in determining the likelihood of successful learning.

All branches of cognitive theory emphasize that the new knowledge must be meaningful to the learner if it is to be retained and used in the future. Another major cognitive theorist, Jerome Bruner (1966) promoted the value of learning by inquiry or discovery, discussed below.

Application of the theory. One cognitive approach, the expository strategy, involves instructional activities that present information to the learner or allow learners to read or view material and think about it, after which they practice applying it in some realistic form. The concerns revolve around attending to

relevant messages, interpreting the new material, relating it to existing mental structures, and remembering it so that it can be retrieved later when needed. Designers must devise ways to gain the learner's attention, in competition with the many distracting stimuli in the environment. Then they want to present the new information in ways that will encourage melding it into the learner's existing mental structures or schemata. One instructional technique derived from schema theory is the advance organizer—a brief preview based on the learner's existing knowledge, which serves as a framework for new learning. Analogies, examples, outlines, and mnemonic devices also make new information easier to remember. To improve retention and use of combinations of knowledge and skills, it is helpful to embed practice in a realistic setting.

Another cognitive approach, the inquiry strategy, turns the expository strategy upside down. It begins by immersing learners in real world problems, leads the learners to make hypotheses about these problems, and guides them to discover an answer. This approach is commonly found in management training, for example, in desert survival simulations.

A rather complete and thorough set of cognitive prescriptions is offered by Foshay, Silber, and Stelnicki (2003) as “a cognitive training model” (p. 23). They offer 17 specific tactics organized around the strategic phases of gaining attention, linking to prior knowledge, structuring the content, presenting the new knowledge, and strengthening the new knowledge through practice and feedback.

Instructional Pattern. Training and education based on the cognitive framework is likely to take the form of lectures or recorded presentations illustrated with audiovisual supplements. In many cases it is more efficient to package cognitive instruction for self-study in the form of textbooks, manuals, or Web documents. In any case, the pattern is likely to consist of a carefully constructed arrangement of information designed to attract and hold attention, to meld the new knowledge with the learner's previous knowledge, and to suggest ways of applying this new knowledge to practical use. The presentation will likely include opportunities to practice in the form of embedded quizzes, provocative questions, or other types of exercises.

Methods. The cognitive approach is likely to incorporate methods focusing on the presentation of information and learner interactions with the material and each other:

- *Presentation*, including illustrated lectures, videos, and *PowerPoint*™ shows
- *Reading*, including textbooks, training manuals, and Web so-called tutorials, which usually are not truly tutorial, in the sense of a rich two-way exchange
- *Demonstration*, including how-to-do-it demonstrations, video demonstrations, and peers or instructors serving as role models
- *Drill-and-practice*, including end-of-chapter exercises, recitation, and memorization drills, such as spelling bees or other game-type activities

- *Discussion*, including debates, seminars, and buzz groups.

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

A Constructivist Framework

A more recent educational theory, constructivism, revolves around the notion that “knowledge is constructed by the learners as they attempt to make sense of their experiences” (Driscoll, 2000, p. 376). Constructivism can be viewed as a philosophy, an epistemology, or an instructional orientation. The label has been used by theoreticians working in different realms. Even within education there is no comprehensive set of beliefs that is embraced by all constructivists. Beyond a certain set of core beliefs, constructivists diverge into several sub-groups, some of whom hold positions that are contradictory to others. This discussion focuses on the core beliefs that are most widely accepted.

Theory Base. A core philosophical belief is that while there is a real world out there, there is no meaning inherent in it; meaning is constructed by people and cultures. In terms of epistemology then, knowledge is constructed from and shaped by experience, and understanding of the world is socially negotiated. The name, constructivism, is a reminder that whatever is done *to* the learner in the name of instruction, ultimately nothing happens until the learner takes those inputs and *constructs* some meaning from them. Hence, giving learners ownership of the knowledge is crucial. Further, that knowledge is useful only to the extent that it is embedded in a real-world context. Generalizations stripped of their context are of little practical use (Duffy & Jonassen, 1992).

Application of the Theory. Prescriptive principles derived from constructivism include: “1. Embed learning in complex, realistic, and relevant environments. 2. Provide for social negotiation as an integral part of learning. 3. Support multiple perspectives and the use of multiple modes of representation. 4. Encourage ownership in learning. 5. Nurture self-awareness of the knowledge construction process” (Driscoll, 2000, pp. 382-383).

Although Merrill rejects the constructivist label for his work, he proposes a set of instructional principles, which he calls “first principles of instruction” (2002a, p. 43), that are problem-centered, progressively more realistic, and focused on knowledge construction by the learner, as shown in Figure 4. These ideas are clearly aligned with the constructivist view. So, until another representation of the constructivist perspective comes along that is at least equally coherent, Merrill’s framework can represent this perspective.

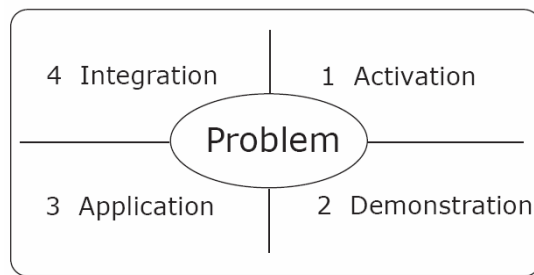


Figure 4. Visual model of the major elements of Merrill's "First Principles"

Merrill's theory proposes four phases in the instructional process: (1) *activation* of prior experience, (2) *demonstration* of skills, (3) *application* of skills, and (4) *integration* of these skills into real-world activities, with all four phases revolving around (5) a *problem*. Each of these five elements has supporting generalizations or principles, which provide the prescriptions for effective instruction. The broadest generalizations about each step of the instructional sequence are:

- (1) Activation: Learning is facilitated when the learner is directed to recall, relate, describe, or apply knowledge from relevant past experience that can be used as a foundation for the new knowledge.
- (2) Demonstration: Learning is facilitated when the learner is shown rather than told.
- (3) Application: Learning is facilitated when the learner is required to use his or her new knowledge to solve problems.
- (4) Integration: Learning is facilitated when the learner can demonstrate his or her new knowledge or skill.
- (5) Problem: Learning is facilitated when the learner is engaged in solving a real-world problem.

(Merrill, 2002a, pp. 45-50)

Instructional Pattern. Merrill also proposes a simple framework for applying his first principles to training situations, called the Pebble-in-the-Pond model (Merrill, 2002b). The essence of his framework is to begin by imagining the simplest whole version of the task that the learner must be able to perform, the first ripple of the pebble dropped into the pond, then to identify the expanding ripples: "a progression of such problems of increasing difficulty or complexity such that if learners are able to do all of the whole tasks thus identified, they would have mastered the knowledge and skill to be taught" (p. 41). The focus on actual on-the-job problems makes this approach highly suited to immediate application on the job, one

of the keys to retention and transfer of training. Merrill reports documented success in terms of better and faster learning.

Methods. Merrill's approach and other constructivist approaches tend to prefer methods that immerse learners in problematic situations:

- *Discovery/Inquiry*
 - Includes laboratory-type activities, such as science experiments, field work, internships, and apprenticeships
 - Includes simulation and game-type activities, such as business games, social simulations, simulations of work situations, video games, and other sorts of immersive environments, including virtual reality
- *Tutorial*, including face-to-face apprenticeship and mentoring; action learning programs that emphasize action, reflection, and mentoring are a good example.
- *Reading*, including particularly Web text with links connecting related ideas, known as hypertext, possibly incorporating sounds and motion images, known as hypermedia.
- *Expression*, including multimedia productions, hypertext document construction, and other projects, especially those that are developed collaboratively
- *Reflection*; more than any other instructional approach, constructivism emphasizes the importance of learners' thinking back on their experiences, typically in the form of a game debriefing, dialog with a coach, keeping a journal, or the like.

Uses. The constructivist approach is well suited to learning advanced skills high in cognitive complexity, particularly in domains that are not well structured, in which there may be many correct solutions to a problem, such as in management. Action learning programs in executive education embody the constructivist approach by combining short formal training sessions with longer periods of on-the-job work under the guidance of a mentor.

An Eclectic Framework

Lesson frameworks are seldom derived purely from one theory base. Although many frameworks reflect multiple influences, including Merrill's, Gagne's Events of Instruction framework is quite self-consciously eclectic, explicitly drawing on different theories.

Theory Base. Gagne, a leading translator of learning theory into instructional theory, proposed in early editions of his influential book, *Conditions of Learning* (Gagne, 1965, 1977), that the information-processing view and the assimilation view of learning could be combined with behaviorist concepts to provide a more complete approach to teaching different learning tasks.

Application of the Theory. Gagne's Events of Instruction framework suggests that certain mental operations must be carried out for successful learning, and it works best to do them in a certain order, at

least when following an expository strategy. When following an inquiry strategy the middle steps may be done in reverse order. The best-known version of his framework has been a robust and influential outline for lesson design:

1. Gaining attention
2. Informing learners of the objective
3. Stimulating recall of prior learning
4. Presenting the content
5. Providing 'learning guidance'
6. Eliciting performance
7. Providing feedback
8. Assessing performance
9. Enhancing retention and transfer

(Gagne & Medsker, 1996, p. 140)

Instructional Pattern. Offered by Gagne as a general guide, this framework can be used to construct a lesson having a specific sequence: (1) gain the learners' attention by telling them or dramatizing the reason for mastering this skill; (2) tell them clearly what they are expected to be able to do after the learning session; (3) remind them of what they already know and how today's lesson adds to that; (4) demonstrate the new skill or present the new knowledge; (5) suggest mnemonic devices, ask probing questions, or give prompts that guide the learners in mastering the content; (6) make sure that the learners have a chance to practice the new knowledge or skill; (7) during the practice, confirm correct responses or desired performance and help them overcome mistakes; (8) test the learners' mastery by having them use the new knowledge, skills, and attitudes in realistic or simulated problem situations; and (9) help the learners connect their new skills with the job by giving them on-the-job practice or simulated practice involving varied problems.

Presenting instruction in this sequence exemplifies an expository or deductive approach: telling the learners The Point—the concept, rule, or procedure you want them to master—and then letting them apply The Point in some practice setting. Sometimes a discovery or inductive approach may be more effective, putting practice and feedback, steps 6 and 7, before steps 2, 3, 4, and 5. This way the learners discover The Point for themselves.

Adaptation: The “Universal Model” of Stolovitch and Keeps. The Events of Instruction template has been adapted and simplified by many authors. For example, Stolovitch and Keeps (2002) offer a “universal model for structuring any learning session” (p. 68), consisting of five major steps: (1) tell the learners the rationale for the lesson, (2) tell them the objectives of the lesson, (3) create learning activities that lead to attaining the objectives, (4) evaluate learner performance, and (5) provide feedback on how

well they mastered the objectives. They reduce the nine steps to five, but keep the essence of Gagne's framework.

Adaptation: Russell's Objectives Alignment Framework. A further simplification, the Objectives Alignment Framework, developed by Russell, is shown in Figure 5.

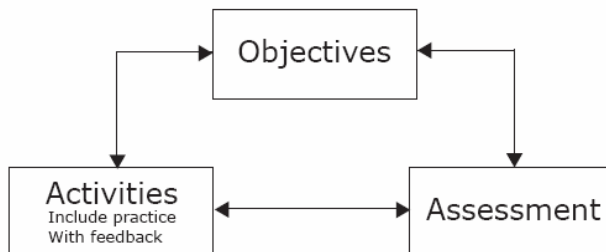


Figure 5. Visual model of James D. Russell's Objectives Alignment Framework

The salient elements of a learning session could be boiled down to three: objectives, activities, and assessments. *Objectives* describe what you want the learners to be able to do *after* instruction. *Activities* are what the learners do *during* instruction to help them learn the content, attitudes, or skills being taught; this usually entails practice with feedback. *Assessments* are how instructors determine if learners have mastered the content, attitudes, and/or skills being taught. As shown in Figure 5, all three components of the lesson structure are interrelated. Any one of the components can be used to begin constructing the lesson and each of the three components is equally important. Some start with the objectives, then select or design the activities, and finally develop the assessment items. If the objectives are clearly stated, it will be fairly easy to develop both of the other components.

Others prefer to start with the activities. They select the readings, class discussions, small-group projects, games and simulations, and other learning activities. They can then develop objectives by answering the question: "What will the students be able to do after they complete these activities?" Then they develop assessment methods that measure successful completion of the activities.

Finally, there are occasions when planners might start with the assessments. Perhaps the assessment will be some sort of company certification exam or an external government exam. The design/development team then selects activities that will enable the students to be successful on the exam. Using the completion of an exam as a method of assessment, they interpret the knowledge and skills required by the test as the lesson objectives.

In short, any one of the three components, if developed well, should lead to the other two. Regardless of where planning starts, all three components should be developed and all three must be

aligned with each other; each component must fit with and support the other two. No matter how clear and ingenious the instructional activities are, they will not be the right activities if they do not give the learners practice on the skills on which they will be assessed. Similarly, if the test is not aligned with the objectives managers will not be able to be sure that the learners have mastered the essential skills.

This Objectives Alignment Framework is probably the simplest and most robust expression of the framework first proposed by Gagne. It has the virtues of being well-tested in practice and easy to communicate to new instructors or designers.

Methods. The eclectic approach may be implemented through a combination of methods associated with the behaviorist, cognitive, and constructivist approaches.

Uses. The eclectic approach is well suited to training goals that combine routine tasks and skills at the intermediate level; they are likely to include cognitive, affective, and psychomotor skills together.

DELIVERY ENVIRONMENTS FOR INSTRUCTION

Instruction can take place in many different environments, from a formal classroom to the actual workplace, and in many places in between or in combination. These delivery environments can be placed into three major categories: face-to-face classroom, which might be augmented by audiovisual media, distance learning that is telecommunications-based or computer-based, and independent self-study.

Face-to-Face Classroom Instruction

Potential Use

The advantages of face-to-face instruction are obvious because the classroom has been and continues to be the most popular venue for instruction. The presence of an instructor and fellow learners gives a social dimension that is difficult to replace. Both the instructor and fellow learners can serve as behavior models and sources of inspiration. The ability to adapt spontaneously and flexibly to the group's needs, the ability to share stories, the opportunity to network, and simply having an appointment to learn give the classroom environment numerous advantages. It is especially appropriate for pursuing interpersonal skills, seeing demonstrations of skills, and practicing those skills with immediate feedback and corrective guidance.

Trends in Use

Despite many earlier predictions to the contrary, face-to-face classroom instruction is still the most universally applied format in the corporate realm, being used “always” or “often” at 91 percent of companies (Galvin, 2003, p. 31) with no significant downward trend over the preceding several years. The traditional audiovisual media used in face-to-face instruction show a pattern of slow decline, although video materials continue to be very widely used. Video recordings are used always or often at 52 percent of responding organizations, according to Galvin (2003, p. 30). The traditional analog media are

being replaced gradually by digital formats, including projection of Web pages and presentation software such as *PowerPoint*TM.

In terms of the percentage of *time spent in training*, instructor-led face-to-face classroom instruction occupied 69 percent of all training time in 2003, a decline of five percent from the previous year. Another ten percent of time was spent in classrooms with remote instructors, an increase of three percent since the previous year. Participation in computer-based learning occupied 16 percent of time, an increase of four percent over the previous year (Galvin 2003, p. 22). So, most organizations still use face-to-face classroom instruction but trainees are spending a larger proportion of their training time in distance or computer-based learning, and the computer-based learning is increasingly delivered through the Internet or private intranets.

Distance Learning via Synchronous Telecommunications Media

Potential Uses

When it is impractical or expensive to bring learners together in one geographic location, but the attributes of face-to-face instruction are still needed, organizations turn to synchronous distance learning, typically through teleconferences transmitted over broadcast, satellite, or computer networks or through a cable television network that is owned or leased by the organization. This assures that everyone gets the same message at the same time and allows real-time two-way exchange.

It is possible to arrange multi-point audio conferences via the Web; these can be combined with electronic whiteboards to allow collaborative learning at a fraction of the expense of other telecommunications options.

Trends in Use

A small proportion of organizations, 12 percent in 2003, used broadcast or satellite television to disseminate training programs to multiple sites (Galvin, 2003, p. 30). Two-way videoconferences distributed over satellite, cable, or Web are used always or often for training at 22 percent of all organizations (Galvin, 2003, p. 30). They tend to be used as supplements to other forms of training or for special purposes, such as the introduction of new products or the rollout of new tools at organizations with widely scattered locations.

Distance learning via Asynchronous Computer-Based Media

Potential uses

Asynchronous, not at the same time, delivery is suited to pre-recorded programs that need to be accessible all the time to many people for independent study. Typically computer-based lessons have been transmitted over local area networks (LAN) or, more recently, through CD-ROM or DVD. Transmission via the Web is becoming increasingly popular. This form of distribution enables anytime, anywhere access. Some degree of interaction or even collaboration among learners is possible through

discussion boards, chat rooms, instant messaging, or shared work spaces. The advantage of asynchronous group interaction is that participants have the time to think about questions or problems and take time to formulate a response. Less assertive participants often find they have a better chance to get a word in edgewise in discussions that are asynchronous.

Trends in Use

Computer-based delivery systems have played a gradually expanding role in training over the past decade. In the early 1990s, this meant modules distributed via floppy disk or LAN. Since then distribution has migrated toward CD-ROM or DVD formats or, more recently, to the Internet or an organizational intranet. In the 2003 *Training* survey 45 percent of companies distributed instruction in digital storage media format. However, 63 percent used Internet or intranet delivery (Galvin, 2003, p. 30).

Games and Simulations

Potential Uses

Games and simulations are often seen as ideal pedagogical methods for learning to make decisions about complex business problems, for practice under realistic conditions, or for repetitive drills on facts or concepts to be memorized. They may be used in face-to-face classroom contexts or in immersive computer environments, so-called microworlds.

Trends in Use

About a quarter of all organizations use classroom-based games and simulations regularly. However, by using the computer to present the problems and select appropriate responses, more sophisticated programs can be run faster and less expensively than in face-to-face settings. Considering these potential advantages, it is perhaps surprising to see that computer-based games and simulations are used regularly within only about ten percent of organizations (Galvin, 2003, p. 31).

Independent Self-Study

Potential Uses

Programmed instruction, developed in the 1960s, dramatically demonstrated the possibility of packaging a wide range of subjects into modules for self-paced independent study. The requirement of continuously interacting with the material and getting feedback about progress at each step accounted partly for the success of this approach. More recently, independent study has been converted to delivery through interactive CD-ROMs or so-called Web tutorials, which typically are not truly tutorial, but do present the content in a step-by-step form. This can be an attractive option because it allows learners to start and stop the program at any time and progress at their individual pace.

On the other hand, experience has shown that learners in the workplace tend to lose interest and drop out of such programs. There appear to be at least two factors at work. First, text-based materials can be repetitive and boring, with only superficial levels of interactivity. Second, self-study does not fit the

way many adults prefer to learn. Adults tend to seek social learning settings; they want to hear stories about others' experiences, what works and what doesn't work.

When self-study is the most practical approach due to time and cost constraints, the loss of the human dimension can be overcome to some extent by employing video episodes in the program. The moving image is certainly preferable when teaching interpersonal skills or complex physical tasks or conveying messages from specific sources, such as a credible expert. Even for verbal material, a human with facial expressions and body language can hold interest far longer than straight text.

Trends in Use

Since 2002, the *Training* survey has included self-study as a separate instructional context. Since then self-study based on print and audiovisual modules has been declining, while the use of Web-based self-study grew from 36 to 44 percent of organizations using it always or often, making it one of the most widely used instructional delivery environments (Galvin, 2003).

Blended Learning

In everyday parlance, trainers have tended to classify learning events into discrete categories: face-to-face classroom instruction, online learning, independent study, action learning, and so on. In fact, though, corporate training and education programs increasingly consist of hybrids; for example, face-to-face classroom meetings interspersed with Web-based team projects; satellite video conferences followed by small-group discussions at remote sites; on-the-job action learning plus mentoring via e-mail. Combining conventional and online delivery has come to be recognized as a third alternative, referred to as blended learning. The advantages of combining formats are obvious. Online activities offer self-pacing, standardization of information dissemination, and rapid deployment of new material; while face-to-face learning allows live human interaction, practice with feedback, team building, networking, and the other functions that are tied to people's emotional responses. There is a growing consensus that the future belongs to blended approaches.

Selecting Delivery Systems

In the instructional technology literature there is a long tradition of creating schemata for matching delivery systems with different learning objectives. A highly regarded guide from the audiovisual era is Reiser and Gagne (1983). More recently, a group of training specialists and consultants (Pallesen, Haley, Jones, Moore, Widlake & Medsker, 1999) have developed a delivery system selection model that attempts to take into account economic factors as well as the capabilities of each of the various categories of delivery systems and environments, including desktop multimedia, satellite, audiovisual media, teleconferencing, internet/intranet, electronic performance support systems, and electronically enhanced live classrooms. They then assess the suitability of each for a range of different learning objectives. The result is a model that would be suitable for selecting appropriate delivery systems and

environments for blended learning, helping to decide which elements of a lesson or course could be delivered electronically and which would work better in a face-to-face classroom environment.

EVALUATING INSTRUCTION AND ASSESSING LEARNER OUTCOMES

Evaluation/assessment may be aimed at two basic targets: the instruction itself and the learners. For each target, three phases of evaluation may be used: formative, summative, and confirmative. Consequently there are six different categories of evaluation/assessment (Hellebrandt & Russell, 1993).

Formative Evaluation of Instruction

Formative evaluation of instruction is done during the development of the materials in order to improve them. Often this type of evaluation is called learner tryout and revision. This type of evaluation is done while the materials are still in draft form.

Summative Evaluation of Instruction

Summative evaluation of instruction is designed to determine the ultimate effectiveness of the materials. Often this process is called validation or verification. It is conducted after the materials have been developed and have been used by the trainees. A major issue is what should be measured to determine success. A widely accepted framework is Kirkpatrick's four levels (1998), which proposes that one could evaluate program success by any of four criteria: (1) the reaction or satisfaction of learners, (2) the attainment of learning objectives, (3) the on-the-job behavior changes that follow instruction, or (4) organizational results, the overall impact of the instructional program on the organization's goals or the so-called bottom line. Managers would be most interested in the fourth level of evaluation, the return on investment. The selection of any of these targets could be justified, but the choice is often made out of convenience rather than out of careful consideration of the demands of the situation. There is widespread agreement that the first level, learner reaction, is the one most often tapped, simply because it is the easiest sort of information to gather and it satisfies the trainer's immediate concern: is my audience happy?

Confirmative Evaluation of Instruction

Confirmative evaluation of instruction is conducted some time after initial implementation of the instruction, perhaps months or years later. The purpose is to determine if that lesson or program is still enabling trainees to meet the original objectives. The evaluation process may determine that the content has changed since the original development of the material or that the characteristics of the target audience have changed. In either case, the materials need to be revised.

Formative Assessment of Learners

Formative assessment of learners is conducted to diagnose learning problems and may result in prescribing some sort of enrichment or remediation. It occurs during instruction and uses self-checks, progress tests, non-graded quizzes, or instructor observation.

Summative Assessment of Learners

This form of assessment is conducted at the end of instruction to give a certification of competency. It can be viewed as a sort of final exam administered to measure trainee achievement. These assessments can be paper-and-pencil or performance-based and they can be norm-referenced, learners compared to each other, or criterion-referenced, with learners compared to an objective standard of competence. Outside of formal education settings, criterion-referenced tests are usually the more appropriate choice. Shrock and Coscarelli (2000) argue forcefully that because test scores can affect people's careers and life paths it is imperative to follow systematic procedures in developing and administering tests, tests that can withstand legal challenge. They provide a fourteen step process for criterion-referenced test development, a process that yields valid and reliable measures of people's mastery of specific competencies. Another comprehensive guide to preparing effective tests, administering tests, analyzing the results, and reporting and using test results is provided by Westgaard (1999).

Confirmative Assessment of Learners

Sometime after completion of instruction, usually months or years later, learners may be re-tested to confirm whether they have maintained their competence demonstrated during summative assessment immediately after the instruction.

CONCLUSION

In the past, instruction was probably overused as a panacea for virtually any and all problems of human performance in the workplace. Now it is seen as one intervention among an array of performance interventions, to be used when there is a clear indication of an ignorance problem.

Another common misconception is that instruction is somehow improved when it is conveyed through a newer media delivery system. Computer-based delivery systems can distribute lessons faster and possibly more inexpensively, but they lead to better learning only if they employ better instructional methods.

In the corporate realm, a standardized approach to developing instruction is often beneficial, streamlining the planning process and assuring some consistency across different times and locations. Adopting or adapting a particular instructional design/development model is a common means of improving instructional planning, and a systems approach model is most often chosen. A weak link in the use of such models is the design stage. It is a complex task to select and apply powerful instructional methods and strategies to widely varying objectives, diverse learners, different working situations, with different delivery systems available.

Designers do not have to start from scratch. They can borrow frameworks, such as the behaviorist, cognitive, constructivist, or eclectic frameworks, to help organize a lesson or module. These are robust generic frameworks that have been proven in practice. At the very least, they can turn to a simple template such as Russell's Objectives Alignment Framework to make sure that at least there is alignment among the lesson's goals, its activities, and its test; this alone makes a huge difference in the effectiveness of a lesson.

Learners can participate in instruction in a variety of delivery environments, from face-to-face classrooms to online tutorials to on-the-job, work-embedded training. There is a trend to move training as close as possible to the work situation, both to save time off the job and to increase the likelihood that the worker will actually use the new knowledge and skills. Distance learning and self-study formats can be vehicles for moving instruction closer to just-in-time. This can be effective as long as everyone remembers that telling isn't teaching, and that the mere transmission of information to the worker is not equivalent to providing instruction. Neither face-to-face classroom instruction nor distance learning is effective unless learners are actively engaged with the material and have opportunities to practice with feedback.

In the end, it is impossible to determine if the design decisions were the right ones without valid evaluation. Formative evaluation of instruction and assessment of learners allow early detection of flaws before final development and implementation. Summative measures allow managers to determine if the training hit the mark in terms of benefits over costs. This is how instruction can prove its value.

REFERENCES

- Atkinson, R.C., & Shiffrin, R.M. (1968). Human memory. A proposed system and its control processes. In K. Spence & J. Spence (Eds.), *The psychology of learning and motivation* (Vol. 2). New York: Academic Press.
- Ausubel, D.P. (1980). Schemata, cognitive structure, and advance organizers: A reply to Anderson, Spiro, and Anderson. *American Educational Research Journal* 17: 400-404.
- Bandura, A. (1969). *Principles of Behavior Modification*. New York: Holt, Rinehart and Winston.
- Bloom, B.S. (Ed.). (1956). The taxonomy of educational objectives, the classification of educational goals, handbook I: Cognitive domain. New York: David McKay.
- Bruner, J.S. (1966) *Toward a theory of instruction*. Cambridge, MA: Belknap.
- Clark, R.D. (2001). *Learning from media: Arguments, analysis, and evidence*. Greenwich, CT: Information Age.
- Davis, J.R. & Davis, A.B. (1998). *Effective Training Strategies*. San Francisco: Berrett-Koehler.

- Dick, W., Carey, L., & Carey, J. O. (2005). *The systematic design of instruction*, 6th ed. Boston: Allyn & Bacon.
- Dills, C.R. & Romiszowski, A.J. (Eds.). (1997). *Instructional development paradigms*. Englewood Cliffs, N.J.: Educational Technology Publications.
- Driscoll, M.P. (2000). *Psychology of Learning for Instruction*, 2nd ed. Boston: Allyn & Bacon.
- Duffy, T.M. & Jonassen, D.H. (Eds.). (1992). *Constructivism and the technology of instruction: A conversation*. Hillsdale NJ: Lawrence Erlbaum Associates.
- Ertmer, P.A. & Newby, T.J. (1993). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly* 6:4, 50-70.
- Foshay, W.R., Silber, K.H., & Stelnicki, M.B. (2003). *Writing training materials that work*. San Francisco: Jossey-Bass/Pfeiffer.
- Gagne, R.M. (1965). *The conditions of learning*. New York: Holt, Rinehart and Winston.
- Gagne, R.M. (1977). *The conditions of learning*, 3rd ed. New York : Holt, Rinehart and Winston.
- Gagne, R.M. & Medsker K.L. (1996). *The conditions of learning: Training applications*. Fort Worth, TX: Harcourt Brace College Publishers.
- Gagne, R. M., Wager, W. W., Golas, K. C., & Keller, J. M. (2005). *Principles of instructional design*, 5th ed. Belmont, CA: Thomson/Wadsworth.
- Galvin, T. (2003, October). 2003 industry report. *Training*, 21-45.
- Glaser, R. (Ed.) (1965). *Teaching machines and programmed learning, II: Data and directions*. Washington DC: Department of Audio-Visual Instruction, National Education Association.
- Gordon, J. & Zemke, R. (2000, April). The attack on ISD. *Training* 37, 43-53.
- Gustafson, K. L. & Branch, R. M. (1997). *Survey of instructional development models*, 3rd ed. Syracuse, NY: ERIC Clearinghouse on Information and Technology.
- Hellebrandt, J. & Russell, J. D. (1993, July). Confirmative evaluation of instructional materials and learners. *Performance & Instruction* 32:6, 22-27.
- Kirkpatrick, D.L. (1998). *Evaluating training programs: the four levels*, 2nd ed. San Francisco: Berrett-Koehler.
- Lumsdaine, A.A. & Glaser, R. (Eds.). (1960). *Teaching machines and programmed learning: A source book*. Washington DC: Department of Audio-Visual Instruction, National Education Association.
- McCombs, B.L. (1986). The instructional systems development (ISD) model: A review of those factors critical to its successful implementation. *Educational Communication and Technology Journal* 34:2, 67-81.

- Medsker, K.L. & Holdsworth, K.M. (Eds.). (2001). *Models and Strategies for Training Design*. Washington, DC: International Society for Performance Improvement.
- Merrill, M.D. (2002a). First principles of instruction. *Educational Technology Research and Development* 50:3, 43-59.
- Merrill, M.D. (2002b). A pebble-in-the-pond model for instructional design. *Performance Improvement* 41:7, 39-44.
- Molenda, M. & Pershing, J.A. (2004). The strategic impact model: An integrative approach to performance improvement and instructional systems design. *TechTrends* 48:2, 26-32.
- Pallesen, P.J.; Haley, P.; Jones, E.S.; Moore, B.; Widlake, D.E.; & Medsker, K.L. (1999). Electronic delivery systems: A selection model. *Performance Improvement Quarterly* 12:4, 7-32.
- Popham, W.J. (1971). Preparing instructional products: Four developmental principles. In Baker R.L. and Schutz R.E. (Eds.). *Instructional product development*, pp. 169-207. New York: Van Nostrand Reinhold Company.
- Reigeluth, C.M. (Ed) (1983). *Instructional-design theories and models*. Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.
- Reigeluth, C.M. (Ed) (1999). *Instructional-design theories and models: A new paradigm of instructional theory, Volume II*. Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.
- Reiser, R. A. & Gagne, R.M. (1983). *Selecting media for instruction*. Englewood Cliffs, N.J. : Educational Technology Publications.
- Romiszowski, A. J. (1981). *Designing instructional systems: decision making in course planning and curriculum design*. London: Kogan Page; New York: Nichols, 1984.
- Rossett, A. & Gautier-Downes, J. (1991). *A handbook of job aids*. San Diego: Pfeiffer.
- Schramm, W. (1962). *Programed Instruction: Today and Tomorrow*. New York: The Fund for the Advancement of Education.
- Shrock, S. & Coscarelli, W. (2000). *Criterion-referenced test development*, 2nd ed. Washington DC: International Society for Performance Improvement.
- Skinner, B.F. (1954). The science of learning and the art of teaching. *Harvard Educational Review* 24:1, 86-97.
- Smaldino, S.E. & Russell, J.D. (2005). *Instructional technology and media for learning*. Upper Saddle River, NJ: Pearson Education.
- Stolovitch, H.D. & Keeps, E. J. (2002). *Telling ain't training*. Alexandria, VA: American Society for Training & Development.
- Westgaard, O. (1999). *Tests that work: Designing and delivering fair and practical measurement tools in the workplace*. San Francisco: Jossey-Bass/Pfeiffer.

Wile, D. (1996). Why doers do. *Performance & Instruction*, 35:2, 30-35.