PEARSON NEW INTERNATIONAL EDITION

# The Systematic Design of Instruction

Walter Dick Lou Carey James O. Carey

Seventh Edition

ALWAYS LEARNING™

PEARSON®

# Pearson New International Edition

The Systematic Design of Instruction
Walter Dick Lou Carey James O. Carey
Seventh Edition

PEARSON®

search of their memories for associated information, (2) appropriate characteristics for any required resource materials, (3) appropriate levels of task complexity for the target population, and (4) the relevance or authenticity of the context in which the skill will be performed. For attitudinal objectives, you will also need to consider circumstances in which the learners are free to make choices without reprisal.

The final task is to specify a criterion or criteria appropriate for the conditions and behavior described and appropriate for the developmental level of the target group. When there is only one correct response possible, many designers omit criteria as they are clearly implied, whereas other designers choose to insert the term *correctly*. When the learners' responses can vary, as they can for tasks in all four domains, criteria that describe the characteristics of an acceptable response must be added. Deriving criteria for psychomotor skills and attitudes typically is more complex in that several observable behaviors generally need to be listed. These behaviors, however, are very useful for developing required checklists or rating scales. In specifying criteria, designers must be careful *not* to rely on imprecise criteria such as "expert judgment." There are several categories of criteria that designers can consider in selecting those most appropriate for a given learner response, such as structure, function, aesthetics, social acceptability, environmental soundness, economic viability, and so forth.

## Rubric for Evaluating Performance Objectives

Criteria you can use for constructing and evaluating elaborated goals, terminal objectives, and performance objectives are summarized in the following rubric to facilitate your work. Space is provided on the left side for marking your judgments and criteria are listed in the right column. You may want to copy the checklist to provide to various reviewers of your materials.

*Designer note:* If an element is not relevant for your project, mark NA in the No column.

| No | Some | Yes | |
|---|---|---|---|
| | | | **A. Goal Statement** Does the goal statement: |
| ___ | ___ | ___ | 1. Describe the ultimate performance context? |
| ___ | ___ | ___ | 2. Describe a context that is authentic and realistic? |
| | | | **B. Terminal Objective** Is there congruence between the terminal objective: |
| ___ | ___ | ___ | 1. Conditions and the context of the learning environment? |
| ___ | ___ | ___ | 2. Behavior and the behavior in the goal statement? |
| ___ | ___ | ___ | 3. Criteria and the criteria in the goal statement? |
| | | | **C. Performance Objective Conditions** Do/will the conditions: |
| ___ | ___ | ___ | 1. Specify the cue or stimulus provided to learners? |
| ___ | ___ | ___ | 2. Specify resource materials/tools needed? |
| ___ | ___ | ___ | 3. Control complexity of task for learners' needs? |
| ___ | ___ | ___ | 4. Aid transfer to performance context (authentic)? |
| | | | **D. Performance Objective Behavior** Is the behavior: |
| ___ | ___ | ___ | 1. Congruent with the behavior in the anchor step of the instructional goal analysis? |
| ___ | ___ | ___ | 2. The *actual* behavior rather than a description of how learners will respond (e.g., "classify" rather than "circle")? |
| ___ | ___ | ___ | 3. Clear and observable rather than vague? |
| ___ | ___ | ___ | **E. Performance Objective Content** Is the content congruent with the anchor step in the instructional goal analysis? |
| | | | **F. Performance Objective Criteria** Are/do criteria: |
| ___ | ___ | ___ | 1. Included only when needed to judge a complex task? |
| ___ | ___ | ___ | 2. Include physical or form attributes? |
| ___ | ___ | ___ | 3. Include purpose/function attributes? |
| ___ | ___ | ___ | 4. Include aesthetic attributes? |
| ___ | ___ | ___ | 5. Include other relevant attributes (e.g., social acceptability, health, environment, economy, parsimony)? |

| No | Some | Yes | |
|---|---|---|---|
| | | | **G. Overall Performance Objective** Is the performance objective: |
| ___ | ___ | ___ | 1. Clear (you/others can construct an assessment to test learners)? |
| ___ | ___ | ___ | 2. Feasible in the learning and performance contexts (time, resources, etc)? |
| ___ | ___ | ___ | 3. Meaningful in relation to goal and purpose for instruction (not insignificant)? |
| | | | **H. (Other)** |
| ___ | ___ | ___ | 1. |

Your complete list of performance objectives becomes the foundation for the next phase of the design process, developing criterion-referenced test items for each objective. The required information and procedures are described in Chapter 7.

## Practice

Judge the completeness of given performance objectives. Read each of the following objectives and judge whether it includes conditions, behaviors, and a criterion. If any element is missing, choose the part(s) omitted.

1. Given a list of activities carried on by the early settlers of North America, understand what goods they produced, what product resources they used, and what trading they did.
   a. important conditions and criterion
   b. observable behavior and important conditions
   c. observable behavior and criterion
   d. nothing
2. Given a mimeographed list of states and capitals, match at least 35 of the 50 states with their capitals without the use of maps, charts, or lists.
   a. observable response
   b. important conditions
   c. criterion performance
   d. nothing
3. During daily business transactions with customers, know company policies for delivering friendly, courteous service.
   a. observable behavior
   b. important conditions
   c. criterion performance
   d. a and b
   e. a and c
4. Students will be able to play the piano.
   a. important conditions
   b. important conditions and criterion performance
   c. observable behavior and criterion performance
   d. nothing
5. Given daily access to music in the office, choose to listen to classical music at least half the time.
   a. important conditions
   b. observable behavior
   c. criterion performance
   d. nothing

Convert instructional goals and subordinate skills into terminal and subordinate objectives. It is important to remember that objectives are derived from the instructional goal and subordinate skills analyses. The following instructional goal and subordinate skills were taken from the writing composition goal in Appendix E. Demonstrate conversion of the goal and subordinate skills in the goal analysis by doing the following:

6. Create a terminal objective from the instructional goal:

   In written composition, (1) use a variety of sentence types and accompanying punctuation based on the *purpose* and *mood* of the sentence, and (2) use a variety of sentence types and accompanying punctuation based on the *complexity* or *structure* of the sentence.
7. Write performance objectives for the following subordinate skills:

   5.6 State the purpose of a declarative sentence: to convey information

   5.7 Classify a complete sentence as a declarative sentence

   5.11 Write declarative sentences with correct closing punctuation.

Evaluate performance objectives. Use the rubric as an aid to developing and evaluating your own objectives.

8. Indicate your perceptions of the quality of your objectives by inserting the number of the objective in either the Yes or No column of the checklist to reflect your judgment. Examine those objectives receiving No ratings and plan ways the objectives should be revised. Based on your analysis, revise your objectives to correct ambiguities and omissions.

## Feedback

1. c
2. d
3. e
4. b
5. d

6–7. Examine the sample terminal objective and performance objectives for the subordinate skills in the writing composition case study in Appendix E.

8. Evaluate your goal elaborations, terminal objectives, and your performance objectives using the rubric. If you want further feedback on the clarity and completeness of performance objectives you have written, ask a colleague for a critique using the rubric.

## References and Recommended Readings


Caviler, J. C., & Klein, J. D. (1998). Effects of cooperative versus individual learning and orienting activities during computer-based instruction. *Educational Technology Research and Development, 46*(1), 5–17. Demonstrates the effectiveness of providing objectives to learners.

Gagné, R. M., Wager, W. W., Golas, K. C., & Keller, J. M. (2004). *Principles of instructional design* (5th ed.). Belmont, CA: Wadsworth/Thomson Learning. The authors describe a five-part performance objective and relate objectives to the various domains of learning.

Gronlund, N. E. (2004). *Writing instructional objectives for teaching and assessment* (7th ed.). Upper Saddle River, NJ: Pearson/Merrill/Prentice Hall. Gronlund describes the derivation of objectives for various types and levels of learning and their use in both teaching and classroom assessment.

Mager, R. F. (1997). *Preparing instructional objectives* (3rd ed.). Atlanta, GA: Center for Effective Performance. This is the latest edition of Mager's 1962 book on objectives. Mager's humor is well served by the branching programmed-instruction format.

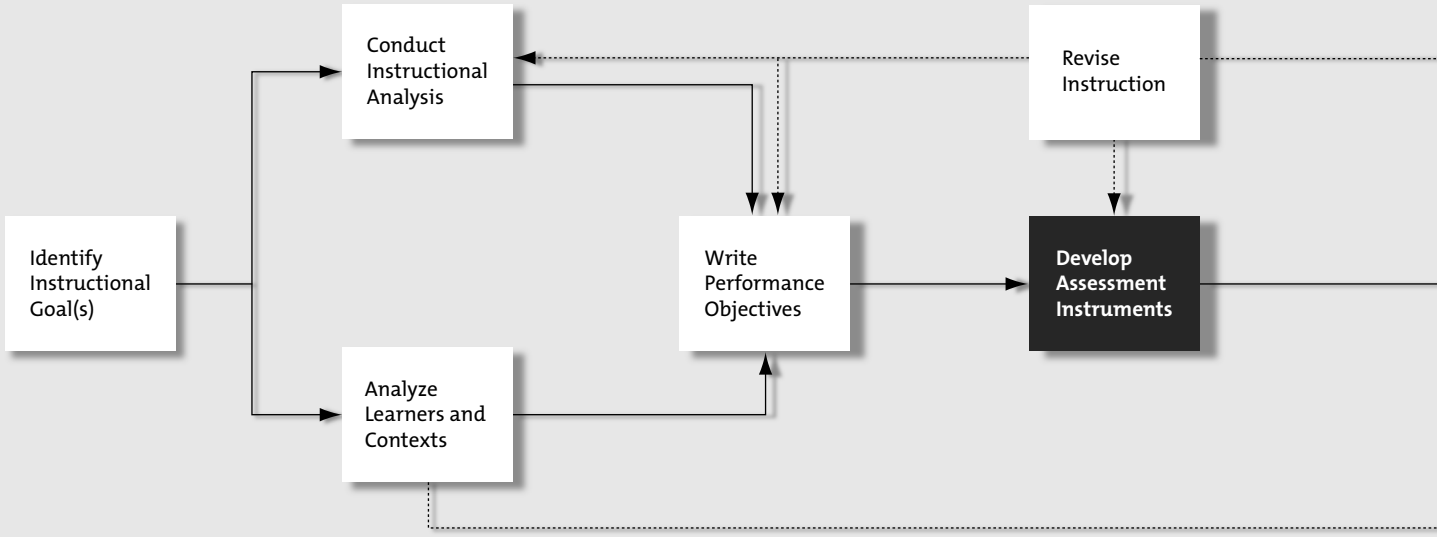
Plattner, F. B. (1997). *Instructional objectives*. Alexandria, VA: American Society for Training and Development.

Roberts, W. K. (1982). Preparing instructional objectives: Usefulness revisited. *Educational Technology, 22*(7), 15–19. The varied approaches to writing objectives are presented and evaluated in this article.

Strayer, J. (Ed.). (2003). *Instructional systems design revisited*. Silver Springs, MD: International Society for Performance Improvement. This e-book compilation of articles from the ISPI journal *Performance Improvement* is available for download from several outlets.

Yelon, S. L. (1991). Writing and using instructional objectives. In L. J. Briggs, K. L. Gustafson, & M. H. Tillman (Eds.), *Instructional design: Principles and applications*. Englewood Cliffs, NJ: Educational Technology Publications.

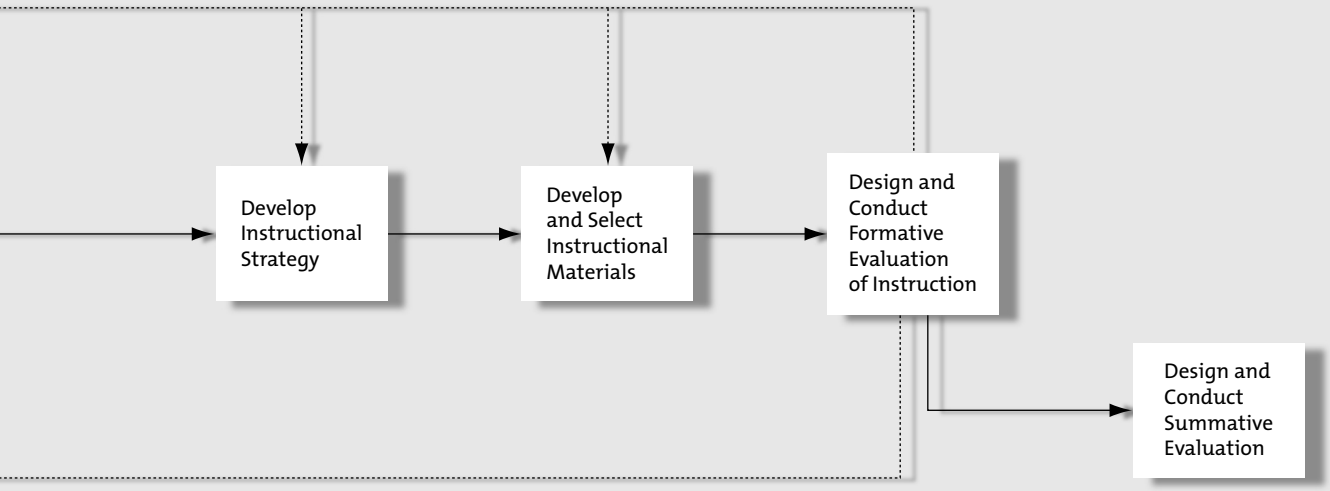
# chapter SIX




## objectives

- Describe the purpose for criterion-referenced tests.
- Describe how entry skills tests, pretests, practice tests, and posttests are used by instructional designers.
- Name four categories of criteria for developing criterion-referenced tests and list several considerations within each criterion category.
- Given a variety of objectives, write criterion-referenced, objective-style test items that meet quality criteria in all four categories.
- Develop instructions for product development, live performance, and attitude assessments; develop rubrics for evaluating learners' work.
- Evaluate instructional goals, subordinate skills, learner and context analyses, performance objectives, and criterion-referenced test items for congruence.

# Developing Assessment Instruments




## Background

Achievement testing is currently at the forefront of the school-reform movement in the United States, and learner-centered assessment permeates the school-reform literature. Learning-centered assessment tasks are expected to function as learning events, and in this model, learners are encouraged to engage in self-assessment on their path to assuming responsibility for the quality of their own work.

The definitions of learner-centered assessment are congruent with traditional definitions of criterion-referenced testing, a central element of systematically designed instruction. Learner-centered assessments are to be criterion-referenced (i.e., linked to instructional goals and an explicit set of performance objectives derived from the goals). This type of testing is important for evaluating both learners' progress and instructional quality. The results of criterion-referenced tests indicate to the instructor exactly how well learners were able to achieve each instructional objective, and they indicate to the designer exactly which components of the instruction worked well and which ones need to be revised. Moreover, criterion-referenced tests enable learners to reflect on their own performances by applying established criteria to judge their own work. Such reflection aids learners in becoming ultimately responsible for the quality of their work.

You may wonder why test development appears at this point in the instructional design process rather than after instruction has been developed. The major reason is

that the test items must correspond one to one with the performance objectives. The performance required in the objective must match the performance required in the test item or performance task. Likewise, the nature of the test items that will be given to learners serves as a key to the development of the instructional strategy.

In this chapter we discuss how designers construct various types of assessment instruments. We use the term *assessment* because "testing" often implies paper and pencil multiple-choice tests. *Assessment* is used as a broader term that includes all types of activities effective for demonstrating learners' mastery of new skills. At this point in the design process, it is necessary to construct sample assessments for each objective.

## Concepts

The major concept in this chapter is criterion-referenced assessment, usually an instrument composed of items or performance tasks that directly measure skills described in one or more performance objectives. The term *criterion* is used because assessment items serve as a benchmark to determine the adequacy of a learner's performance in meeting the objectives; that is, success on these assessments determines whether a learner has achieved the objectives in the instructional unit. More and more often the term *objective-referenced* is being used rather than *criterion-referenced* in order to be more explicit in indicating the relationship between assessments and performance objectives. Assessment items or tasks are referenced directly to the performance described in the objective for the instructional materials. You may therefore consider these two terms—*objective* and *criterion*—essentially synonymous.

Another use of the word *criterion* relates to specification of the adequacy of performance required for mastery. Examples of this second type of criterion include such benchmarks as the student will "answer all the items correctly," "follow all six steps in the safe storage of flammable liquids," and "cut an angle with an accuracy level of five degrees." This type of criterion specification may be established for one test item written for one performance objective, several test items written for one objective, or several test items written for many objectives. Clarity in specifying objectives and criteria for adequate performance is necessary as a guide to adequate test construction. Based on a particular performance objective using established criteria, a posttest may require only one test item or it may require many.

### Four Types of Criterion-Referenced Tests and Their Uses

There are basically four types of tests the designer may create, including the entry skills test, the pretest, practice or rehearsal tests, and posttests. Each of these test types has a unique function in designing and delivering instruction. Let's look at each type of test from the viewpoint of the person who is designing instruction. What purposes do they serve within the instructional design process?

**Entry Skills Tests** The first type of test, an entry skills test, is given to learners before they begin instruction. These criterion-referenced tests assess learners' mastery of prerequisite skills, or skills that learners must have already mastered before beginning instruction. Prerequisite skills appear below the dotted line on the instructional analysis chart. If there are entry skills for an instructional unit, test items should be developed and used with learners during the formative evaluation.

It may be found that, as the theory suggests, learners lacking these skills will have great difficulty with the instruction. In contrast, it may be found that for some reason the entry skills are not critical to success in the instruction. It should be noted that if there are no significant entry skills identified during the instructional analysis, then there would be no need to develop corresponding objectives and test items.