# 7 DEFINING PERFORMANCE OBJECTIVES

Instructional design technology involves correction and revision of instruction based upon the results of empirical testing. Therefore, it is essential that the desired outcomes of the designed instruction be clearly and unambiguously stated. These outcomes are variously referred to as *behavioral objectives, learning objectives,* or *performance objectives.*

We define a performance objective as a precise statement of a capability that, if possessed by the learner, can be observed as a performance. The question the designer must be able to answer before starting the development of any instruction is, "What will these learners be able to do after the instruction, that they couldn't (didn't) do before?" or, "How will the learner be different after the instruction?"

Precision in the definition of objectives meets the need for communication of the purposes of instruction and the need for evaluation of instruction. Objectives that are precisely defined provide a common technical basis for meeting both of these needs. The instructor wants to communicate the intended outcomes of instruction to students, teachers, and parents (when appropriate). Although these communications usually differ from one another in the ways they are stated, the instructor nevertheless wants all of them to express the same idea. This goal can best be achieved by having available a technically complete definition of the objective. Likewise, the instructor wants the observations (or test) used in evaluating the outcome of learning to reflect the commonly understood idea of this outcome. Again, this can best be achieved

by reference to a technically adequate definition of the outcome. Precise definitions of objectives become the specification for "domains" from which items for achievement testing are drawn (Popham, 1975). Objective definitions thus ensure that what is evaluated and what is communicated as an intended learning outcome have a common meaning.

As has often been suggested, the procedure for overcoming the ambiguity of course purpose statements, and thereby achieving greater precision, runs somewhat as follows: "All right, I will accept this statement as reflecting upon one of the purposes of the course. The question now is, how will I know when this purpose has been achieved?"

How will one know that the student "understands the principle of commutativity?"

How will it be known that the student "appreciates allegory in *A Midsummer Night's Dream*"?

How can it be told that the student "comprehends spoken French"?

How will one tell that the student "reads short stories with enjoyment"?

Statements of course purposes may be quite successful in communicating general goals to fellow teachers, yet they are often not sufficiently precise for unambiguous communication of the content and outcomes of instruction. The key to their ambiguity is simply that they do not tell how a person could observe what has been accomplished without being present during the lesson itself. Another teacher, who accepts the general purpose of the course, may wish to know how to tell when it has been accomplished. It may be of interest to a parent who may not know exactly what "commutative" means but wishes to assure himself that his son or daughter can in fact use this principle in performing arithmetic operations. It is likely to be of interest to students who want to be able to tell when their own performance reaches the goal that the teacher or textbook had in mind.

## ACHIEVING PRECISION IN OBJECTIVES

An objective is precisely described when it communicates to another person what would have to be done to observe that a stated lesson purpose has in fact been accomplished. The statement is imprecise if it does not enable the other person to think of how to carry out such an observation. Consider the following instances:

1. "Realizes that most plant growth requires sunshine." Such a statement doesn't say or imply how such an outcome would be observed. Does it mean that the teacher would be satisfied with the answer to the question "Is sunshine necessary for the growth of most plants?" Evidently not. How, then, would such an objective be observed?
2. "Demonstrates that sunshine affects plant growth." This statement implies that the teacher must observe instances in which the student shows that he

knows the relation between sunshine and plant growth. The observation assumes the relation between sunshine and plant growth. The observation might be made in various ways (by using actual plants, pictures, or verbal statements). The main point is, it tells in a general way what sort of observation is required.

A number of types of capabilities (learning outcomes) have been described in previous chapters. In writing objectives to specify these outcomes we use a convention that we call the "five-component objective". The five-component objective specifies the situation in which the performance is performed; the type of learned capability; the object of the performance; the specific action the learner takes in employing the capability; and the tools, constraints, or special conditions associated with the performance. This chapter discusses the five-component convention and the classification of objectives by learning type.

## Components of Objectives

One purpose for unambiguous objectives is to enable the designer to determine which *conditions of learning* should be included in the instructional materials. The five-component objective is more specific than the definitions suggested by other authors (Mager, 1975; Popham and Baker, 1970). The reason for greater specificity is to communicate more information about the type of learning outcome that is desired. We cannot directly observe that someone has acquired a new capability. We can only infer that the capability has been attained through the observation of satisfactory performance by the learner on a task that employs that capability. Often the particular performance (action) exhibited by the learner is confused with the capability. The five-component method of writing objectives seeks to avoid this confusion by specifying two verbs: one to define the capability, and a second to define the observable action. Each component of a five-component objective serves an express purpose as described in the following paragraphs.

### *Situation*

What is the stimulus situation faced by the student? For example, when asked to "type a letter," is the student given parts of the letter in longhand copy? Is the letter to be produced from an auditory message or from notes? Obviously, what the student actually does is highly dependent on the situation. An objective must specify the features of this situation.

Sometimes, it may be desirable for the objective to include a description of the environmental conditions under which the behavior is to be performed on the job. For example, in the case of typing a letter, is this to be done in a quiet room with no other disturbances, or is it more likely that it will be in

a busy office with phone interruptions, people walking by, or other tasks coming in? For many types of learned behavior the environment in which the behavior is performed may not be terribly important. However, for other performances, for example, donning a gas mask, it may be critical.

### *Learned Capability Verb*

Some of the problems with the use of behavioral objectives arise from ambiguity about what type of learning outcome the demonstrated behavior actually represents. For example the statement, "Given an IBM typewriter, types a business letter in 15 minutes of less," tells us very little about the type of learned capability intended. It might mean "types a copy of a letter from handwritten draft," or it might mean a quite different capability, "composes a business letter." This ambiguity can be reduced by including within the objective an indicator of the type of learned capability being demonstrated.

There are nine different learned *capability verbs* as shown in Table 7-1. These pertain to four of the learned capabilities described in previous chap-

**TABLE 7-1. Standard Verbs to Describe Human Capabilities, with Examples of Phrases Incorporating Action Verbs**

| *Capability* | *Capability Verb* | *Example (Action Verb in Italics)* |
|---|---|---|
| *Intellectual Skill* | | |
| Discrimination | discriminates | discriminates by *matching* French sounds of *u* and *ou* |
| Concrete Concept | identifies | identifies, by *naming* the root, leaf, and stem of representative plants |
| Defined Concept | classifies | classifies, by *using a definition,* the concept family |
| Rule | demonstrates | demonstrates, by *solving* verbally stated examples, the addition of positive and negative numbers |
| Higher-Order Rule (Problem solving) | generates | generates, by *synthesizing* applicable rules, a paragraph describing a person's actions in a situation of fear |
| *Cognitive Strategy* | adopts | adopts a strategy of imagining a U.S. map, to recall the states, in *writing* a list |
| *Verbal Information* | states | states *orally* the major issues in the presidential campaign of 1932 |
| *Motor Skill* | executes | executes *backing* a car into a driveway |
| *Attitude* | chooses | chooses *playing golf* as a leisure activity |

ters, and to the five subordinate types of intellectual skills. These verbs may be used to *classify* each of the nine types of learning outcomes. By including one of these verbs in the objective, the intended behavior is more clearly communicated, and the conditions of learning appropriate to that type of learning outcome are more readily applied.

### *Object*

The object component indicates the content of the learner's performance. For example, if the learned capability is the procedure for calculating the sum of two three-digit numbers (a rule), the learned capability and its object might be stated as: Demonstrates (the learned capability verb) *the calculation of the sum of two three-digit numbers* (the object).

The letter example given previously could be stated as: "generates a business letter" (problem solving) or "executes the typing of a business letter" (motor skill). However, there is still some ambiguity in the objective: How is generation of the business letter to be observed? An indicator of the observable performance is needed, and this is the function of the *action verb.*

### *Action Verb*

The action verb describes how the performance is to be completed, "executes a copy of a business letter by typing" describes the action one would observe (the typing). For the problem-solving objective, the observable behavior is also typing: "generates a business letter by typing a reply to a job inquiry." There are innumerable action verbs: matching, writing, speaking, discussing, pointing, selecting, drawing, etc. Table 7-1 demonstrates how the learned capability verbs and action verbs work together to describe a task. We will describe the process of writing performance objectives shortly, but keep one rule in mind: *never use one of the nine learned capability verbs as an action verb.* This will avoid confusion when it comes to sequencing the objective later on.

### *Tools, Constraints, or Special Conditions*

In some situations the performance will require the use of special tools, certain constraints, or other special conditions. For example, the letter may have to be typed using a Savotti Model 11 Teletypewriter. Notice that the objective is not aimed at the acquisition of skill with the Savotti; instead, it is a special condition placed on the performance of typing the letter. An example of a constraint could be a criterion of performance; a letter might have to be completed within a specified time, with fewer than three errors. As is true of the situation, the indication of any special conditions or tools may imply other prerequisite skills that must be learned before the target skill can be adequately evaluated.

likely pay attention to the context in which the cognitive skills are presented, attempting to make the newly learned skill meaningful (relevant) for the learner, and building as much reinforcement into the learning situation as possible.

### Statements of Objectives and Criteria of Performance

Some systems of writing performance objectives (Mager, 1975) require the inclusion of a criterion of performance in the objective. The system we suggest does not. That is, the objective statements themselves do not necessarily describe "how many times the student is to demonstrate the addition of mixed numbers," or how many "errors" will be permitted. There are two reasons why a designer might wish to avoid including the criterion statement in the objective. First, the necessary criteria are likely to be different for each type of human capability, and it is desirable to avoid the error of thinking they can be the same. For example, if a skill is prerequisite to learning another skill the level of performance specified to denote mastery might have to be higher than if the skill is not prerequisite to learning another skill. Second, the question of criteria of performance is a measurement question, and should be considered with assessment procedures. At the point in instructional planning when objectives are being described, it is potentially confusing to be concerned with assessment procedures. (Such procedures are described in Chapter 13.)

However, if the criteria of performance for a given task are already known at the time of writing the objective, the criterion statement can become a component of the objective, falling under the category of "tools, constraints, and special conditions." It would be perfectly acceptable to have an objective like the following:

> Given a 3-page handwritten manuscript, executes typing of the manuscript within 20 minutes with fewer than six errors.

## EXAMPLES OF OBJECTIVES

One of the first questions from new learners of the five-component format is, "Is it really practical to require that all five components be specified?" Our answer is that an objective statement is written for the purpose of unambiguous communication of intent. If you can communicate unambiguously without all five components, then do so. For example, take the objective, "States the names of the 50 states in the United States of America." This seems like a pretty unambiguous statement, and all that is included is the learned capability verb and the object. But notice that even in this objective there are many assumptions; a classroom situation, a verbal question, 100% recall, written or oral response. There is nothing wrong with the objective as stated, but it leaves some of the components open for interpretation.

The following examples show how the five-component format can be used in a number of different subject areas to make vaguely stated objectives more specific.

## Examples in Science Instruction

Suppose that the instructional designer formulates in a written statement the purposes to be accomplished by a course of instruction. If the lesson is one of science, the following purposes might be considered. These have been abstracted from a list of objectives for junior high school science instruction prepared by the Intermediate Science Curriculum Study (1973).

1. Understanding the concept of an electric circuit
2. Knowing that a major advantage of the metric system in science is that its units are related by factors of ten
3. Taking personal responsibility for returning equipment to its storage places

### *Objective No. 1—The Concept of an Electric Circuit*

This is a fairly straightforward purpose for instruction. The first question to be asked by an instructional designer is: "What kind of capability am I looking for here?" Do I mean by "understanding" something like "stating what an electric circuit is?" No, that would not be convincing, since it might merely indicate that the student had acquired some verbal information which he could repeat, perhaps in his own words. Do I mean "distinguishing an electric circuit from a noncircuit when shown two or more instances?" No, I cannot be sure that the student has the understanding I wish in this case, because he may simply be able to pick up the cue of an open wire in the instances shown him and respond on that basis. What I actually want the student to do is to *show me that he can use a rule for making an electric circuit* in one or more specific situations. The rule to be learned has to do with the flow of electric current from a source through a connected set of conductors and back to the source. The student could be asked to exhibit this performance in one or more situations.

The result of this line of reasoning is an objective statement that puts together the necessary components as follows:

> [Situation] Given a battery, light bulb and socket, and pieces of wire [LCV] demonstrates [object] the making of an electric circuit [action] by connecting wires to battery and socket and [constraint] testing the lighting of the bulb.

### *Objective No. 2—Knowing Something about the Metric System*

The statement of purpose in this instance implies that some verbal information is to be learned. Again, the first question to be asked by the instructional designer is, "What do I mean by 'knowing' this fact about the metric system?

What will convince me that the student 'knows'?" In this instance, the designer may readily come to the conclusion that "knowing" means being able to state the particular fact about the metric system. Accordingly, the identification of the required capability as verbal information is fairly straightforward. The resulting objective can then be constructed as follows:

> [Situation] Given the question: "What major advantage for scientific work do the units of the metric system have?" [LCV] states [object] the "tens" relationship among units [action] by writing [constraints] in his own words.

### *Objective No. 3—Taking Responsibility for Equipment*

In thinking over this instructional purpose, the designer will immediately realize that it is not concerned with whether the students are able to put equipment back in its place, but rather with whether they tend to do so on all appropriate occasions. The word "responsibility" implies that the actions of a student may occur at any time, and are not expected to result from any specific direction or questions. The designer must ask, "What would convince me that the student is 'taking responsibility' of this sort?" The answer to this question implies that the objective in this case deals with choices of personal action, in other words, with an attitude.

The standard method of constructing the objective would therefore take this form:

> [Situation] Given occasions when laboratory activities are completed or terminated [LCV] chooses [object] courses of action [action] returning equipment to its storage places.

## An Example from English

A second example of the procedure for constructing statements of objectives comes from a hypothetical course in English literature. Suppose that a set of lessons in such a course had the following purposes:

1. Identifying the major characters in *Hamlet*.
2. Understanding Hamlet's soliloquy.
3. Being able to recognize a metaphor.

### *Objective No. 1—Identifying the Major Characters in Hamlet*

This objective, according to our model, involves using definitions to classify. In this case the student is being asked to classify characters in *Hamlet* in accordance with their functions within the plot of the play. Under most circumstances, it would be assumed that doing this by way of verbal statements would be convincing. That is, the student answers a question like: "Who was Claudius?" by defining Claudius as the king of Denmark, Hamlet's uncle,

[Situation] Given the statement of an issue of constitutionality contained in a fictitious Act of Congress, and reference to the constitutional principle to be invoked [LCV] generates [object] a proposed judicial opinion [action] in written form.

## USING OBJECTIVES IN INSTRUCTIONAL PLANNING

When instructional objectives are defined in the manner described here, they reveal the fine-grained nature of the instructional process. This in turn reflects the fine-grained characteristics of what is learned. There may be scores of objectives for the single topic of a course, and several for each individual lesson.

How does the instructional designer employ these objectives in his development of topics, courses, or curricula? And how does the teacher use objectives? Can the teacher, as the designer of an individual lesson, make use of lengthy lists of objectives? Many such lists are available, it may be noted, for a variety of subjects in all school grades.

### Objectives and Instruction

The instructional designer, or design team, faces the need to describe objectives as part of each individual lesson. Typically, there will be several distinct objectives for a lesson. Each may then be used to answer the question, "What kind of a learning outcome does this objective represent?" The categories to be determined are those corresponding to the major verb indicating capability. That is, the objective may represent verbal information, an intellectual skill in one of its sub-varieties, a cognitive strategy, an attitude, or a motor skill. Having determined the categories of a lesson's objectives, the designer will be able to make decisions about the following matters:

1. whether an original intention about the lesson's purpose has been overlooked, or inadequately represented;
2. whether the lesson has a suitable "balance" of expected outcomes; and
3. whether the approach to instruction is matched to the type of objective in each case.

#### *The Balance of Objectives*

The objectives identified for each lesson are likely to represent several different categories of learning outcome. First of all, it may be possible to identify a primary objective—one without which the lesson would seem hardly worthwhile. In addition, however, there are necessarily bound to be other objectives that must be learned prior to the desired objective. Thus, the lesson that has an intellectual skill as its primary objective is likely to be supported by other objectives classifiable as cognitive strategies, information, or attitudes. As an

example, one might expect a lesson having as its primary objective the intellectual skills of "demonstrating chemical equations for the oxidation of metals" to also include objectives pertaining to information about common metallic oxides, and to favorable attitudes toward possessing knowledge about metallic oxides. How to reflect these several objectives in lesson design is a subject for later chapters. The first step, however, is to see that a reasonable balance of the expected outcomes is attained.

### *Designing Instruction*

Clearly, then, the systematic design of lessons making up a topic or course will result in the development of a sizeable collection of statements of objectives. This collection will grow as lessons are developed and assembled into topics. Decisions about the correspondence of these objectives with original intentions for the topic and course, and judgments about the balance of objectives, can also be made with reference to these larger instructional units. As in the case of the individual lesson, these decisions are made possible by the categorization of objectives into types of capabilities to be learned.

The teacher's design of the single lesson also makes use of individual statements of objectives and the classes of capabilities they represent. The instructional materials available to the teacher (textbook, manual, or whatever) may identify the objectives of the lesson directly. More frequently, the teacher may need to (1) infer what the objectives are; and (2) design the lesson so that the objectives represented in the textbook are supplemented by others. For purposes of planning effective instruction, the determination of categories of expected learning outcomes is as important to the teacher as it is to the design team. The teacher, for tomorrow's lesson, needs to make decisions about the adequacy with which the lesson's purpose is accomplished, and about the relative balance of the lesson's several expected outcomes.

## Objectives and Assessment

Fortunately, the lists of individual objectives developed in a systematic design effort have a second use. Descriptions of objectives, as we have said, are descriptions of what must be observed to verify that the desired learning has taken place. Consequently, statements of objectives have direct implications for assessing student learning (see Chapter 13).

The teacher may use objective statements to design situations within which student performance can be observed. This is done to verify that particular outcomes of learning have in fact occurred. Consider the objective: "Given a terrain map of the United States and information about prevailing winds, demonstrates the location of regions of heavy rainfall by shading the map (applying a rule)." This description more or less directly describes the situation a teacher can use to verify that the desired learning has taken place. A student or group of students could be supplied with terrain maps, prevailing

wind information, and asked to perform this task. The resulting records of their performances would serve as an assessment of their learning the appropriate rule.

With comparable adequacy, statements of objectives can serve as bases for the development of teacher-made tests. These in turn may be employed for formal kinds of assessment of student performance, when considered desirable by the teacher. Alternately, they can be used as "self-tests" that students employ when engaging in individual study or self-instruction.

The classes of objectives described in this chapter constitute a taxonomy that is applicable to the design of many kinds of assessment instruments and tests. A somewhat different, although not incompatible, taxonomy of objectives is described in the work of Bloom (1956), and in that of Krathwohl, Bloom, and Masia (1964). The application of this latter taxonomy to the design of tests and other assessment techniques is illustrated in many subject matter fields in the volume edited by Bloom, Hastings, and Madaus (1971). This work describes in detail methods of planning assessment procedures for most areas of the school curriculum. Further discussion of methods for developing tests and test items based on the categories of learning outcomes described in this chapter is contained in Chapter 13.

## SUMMARY

The identification and definition of performance objectives is an important step in the design of instruction. Objectives serve as guidelines for developing the instruction and for designing measures of student performance to determine whether the course objectives have been reached.

Initially, the aims of instruction are frequently formulated as a set of purposes for a course. These purposes are further refined and converted to operational terms by the process of defining the performance objectives. These describe the planned outcomes of instruction, and they are the basis for evaluating the success of the instruction in terms of its intended outcomes. It is recognized, of course, that there are often unintended or unexpected outcomes, judged, when later observed, to be either desirable or undesirable.

This chapter has presented a five-component guide to the writing of performance objectives. The five elements are:

1. situation
2. learned capability
3. object
3. action
5. tools and constraints

Examples are given, showing how these components can be used to make unambiguous statements of objectives for different school subjects. The ex-

amples chosen also illustrate objectives for various categories of learned capabilities.

Special attention is called to the need for care in choosing action verbs suitable for describing both the learned capability inferred from the observed performance and for describing the nature of the performance itself. Table 7-1 presents a convenient summary of major verbs and action verbs.

The kinds of performance objectives described for the various categories of learned capabilities play an essential role in the method of instructional design presented in this book. Precisely formulated definitions of objectives within each category serve as a technical base from which unambiguous communications of learning outcomes can be derived. Different communications of objectives, conveying approximately a common meaning, may be needed for teachers, students, and parents. At the same time, precisely defined objectives relate the same common meanings to the construction of tests for evaluation of student performance, as will be indicated later in Chapter 13.

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