

A GUIDE TO DEVELOPING COGNITIVE LEARNING OBJECTIVES

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Table of Contents

Introduction	3
Classification of Learning Objectives	3
General or overall objective	3
Specific objective	3
Difference between an instructional goal and a general learning objective	4
Taxonomy of Educational Objectives	4
Cognitive domain	4
Affective domain	4
Psychomotor domain	4
Developing Learning Objectives Based on the Cognitive Domain.....	5
The condition.....	5
The behavior	5
The degree	5
Continuum of Cognitive Domain Objectives	6
Examples of Cognitive Learning Objectives.....	6
Table 1: The Cognitive Domain of Objectives.....	8
Table 2: Definitions of Behavioral Verbs for Learning Objectives	9
Table 3: Assessing Learning Objectives Using Bloom’s Taxonomy.....	11
Reference List.....	13

Introduction

A curriculum is designed as a response to education and/or training needs, and the degree of precision of articulating the learning objectives is directly related to achieving the desired learning outcomes. Additionally, learning objectives can be derived from a knowledge/skill gap identified in a front-end needs analysis. Consequently, the goal of creating learning objectives is to provide a means of clarifying the purpose of instruction to ensure the training/education is successful and the objectives are achieved. Clearly identifying learning objectives improves the communication between the instructor and the learner for a given course/learning module so the student knows precisely what is expected of him/her. When the objectives of a course have been clearly identified and presented in an orderly progression, the desired learning outcomes will be attained. They may also assist in the choice of the instructional delivery method(s) and instructional strategies when designing a learning activity, as well as establishing criteria for student performance when assessing student learning outcomes (Dick, Carey, & Carey, 2005). “When clearly defined objectives are lacking, there is no sound basis for the selection or designing of instructional materials, instructional strategies, or assessments” (Mager, 1999). “A properly written objective tells you what specific knowledge, skill, or attitude is desired and what method of instruction and criteria for learner achievement are required” (Lohr, n.d., pp 7). A learning objective (also referred to as instructional objective or performance objective) is a succinct statement that describes the specific learning activity and includes a description of a performance you want learners to be able to exhibit in order to evaluate competency. It is expressed in terms of the student and formulated in terms of observable behavior and the special conditions in which the behavior is manifested. An instructional objective describes an intended outcome of instruction rather than an instructional procedure (Mager, 1999).

Classification of Learning Objectives

Learning objectives can be categorized as either general or specific.

General or overall objective

Statement of the trend of the learning activity. The general objective defines the outcome of the instructional unit and represents the general orientation of lesson. The general objective is the first level of specification of the lesson/unit of instruction and sometimes referred to as Terminal Course Objectives (TCO) or Terminal Learning Objectives. Each terminal objective is analyzed and broken down into smaller objectives that measure an element of the terminal learning objective. A terminal learning objective is at the highest level of learning appropriate to the human performance requirements a student will accomplish (Clark, 1995).

Specific objective

Sometimes referred to as learning objectives, enabling objectives, performance objectives, instructional objectives, or behavioral objectives, an “...objective is a detailed description of what students will be able to do when they complete a unit of instruction” (Dick et al., 2005. pp 125) and are derived from the general objectives or TCOs. It is expressed in terms of the student and formulated in terms of observable behavior and the special conditions in which the behavior is manifested. The specific objective is the second level of specification of the lesson and must be developed for each of the tasks selected in the learning program (Mager, 1975).

The following general rules should prove useful in writing specific instructional objectives:

- Be Concise. An instructional objective is a specific statement of what the learners will be able to do when they complete the instruction (Dick et al., 2005)
- Be Singular. Should focus on one aspect of behavior
- Be Realistic. An instructional objective should focus on observable behavior, not on teacher illusions or indefinable traits.

Difference between an instructional goal and a general learning objective

An instructional goal is a statement of the intended general outcome of an instructional unit. An instructional goal statement describes a more global learning outcome, while a learning objective is a statement of specific performances which contributes to the attainment of the goal. A single goal may have numerous specific learning objectives, and “for every unit of instruction that has a goal, there is a terminal objective” (Dick et al., 2005, pp 131).

Taxonomy of Educational Objectives

Following the 1948 Convention of the American Psychological Association, a group of college examiners considered the utility of a system of classifying educational goals for the evaluation of student performance. To these examiners, a classification system represented the appropriate place to start (Schugurensky, 1996-2002). Years later and as a result of this effort, Benjamin Bloom formulated a classification of "the goals of the educational process". Eventually, Bloom established a hierarchy of educational objectives for categorizing level of abstraction of questions that commonly occur in educational settings (Bloom, 1965). This classification is generally referred to as **Bloom's Taxonomy**, and consists of three overlapping “domains”: the cognitive, psychomotor, and affective (Clark, 1999).

Cognitive domain

Demonstrated by knowledge recall and the intellectual skills: comprehending information, organizing ideas, analyzing and synthesizing data, applying knowledge, choosing among alternatives in problem solving, and evaluating ideas or actions (Mager, 1999).

Affective domain

Demonstrated by behaviors indicating attitudes of awareness, interest, attention, concern, responsibility, ability to listen and respond in interactions with others, and ability to demonstrate those attitudinal characteristics or values which are appropriate to the test situation and the field of study (Learning Taxonomy-Krathwohl's Affective Domain, n.d.). This domain relates to emotions, attitudes, appreciations, and values, such as enjoying, conserving, respecting, and supporting. Its domain levels include: Receiving, responding, valuing, organization, and character of value.

Psychomotor domain

Focus is on physical and kinesthetic skills. This domain is characterized by progressive levels of behaviors from observation to mastery of a physical skill (Psychomotor Domain Taxonomy, n.d.). Psychomotor learning is demonstrated by physical skills: Coordination, dexterity, manipulation, grace, strength, speed; actions which demonstrate the fine motor skills such as use of precision instruments or tools, or actions which evidence motor skills. Domain levels include: Perception, set, guided response, mechanism, complex or overt response, adaptation (Learning Taxonomy-Simpson's Psychomotor Domain, n.d.).

Developing Learning Objectives Based on the Cognitive Domain

Instructionally sound learning objectives contain four components that comprise and identify each specific learning objective. Normally, each objective identifies the *audience* the objective is directed towards, per se, the who... *The student will be able to*, and contains these other three essential components: the *condition*, a statement that describes the conditions under which the behavior is to be performed, per se, what a learner is expected to be able to do given a specific situation; a *performance verb* that defines the observable behavior itself; and the *degree* (criteria), to which a student must perform the behavior (Mager, 1984). Note: The essential components of instructionally sound learning objectives can be organized into a mnemonic: ABCD, which represents audience, behavior, condition, and degree.

The condition.

The condition part of an objective specifies the circumstances, commands, directions, etc., that the student is given to initiate the behavior. All behavior relevant to intended student learning outcomes can best be understood within a context of the conditions under which the behavior is to be performed or demonstrated. In other words, under what circumstances will the learning occur? What will the learner be given or already be expected to know to accomplish the learning? For example, a condition could be stated as *given a case study, given a diagram, given a map, after a lecture or demonstration, after completing the reading*, etc.

The behavior

The behavior verb (Table 2) denotes an overt, observable action (behavior), such as *identify, name, list, describe*, etc. Listed on this table are some definitions of behavioral verbs for specific learning objectives.

The degree

The degree, or criteria, is a set of descriptions that describe *how well* the behavior must be performed to satisfy the intent of the behavioral verb. The criterion describes acceptable performance by describing how well the learner must perform in order to be considered competent. The criterion answers the question, what do you expect the learner to be able to do in achieving an acceptable performance? For example: *within a given period of time, such within 20 minutes; or, according to the information given in the text, lab manual, lecture; or, in accordance with recommendations of some external source.*

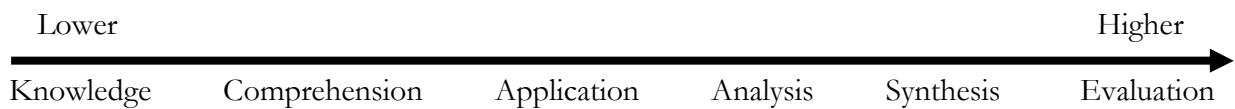
When developing the criteria statement, "...specifying the number of times the learners are to perform the task (e.g., two out of three times or ...correctly 80% of the time)" does not indicate the criteria but instead are questions of level of mastery. The question of *how many times* or *how many items correct* and similar statements are questions of mastery" (Dick et al., 2005, pp 130) that are assessed in a criterion referenced test. Occasionally, the criteria may be implied within the objective, for example, "*Given a set of whole numbers (condition) the student (audience) will be able to calculate the median (behavior)*", it is implied the criteria (degree) will be computed accurately. However, the level of accuracy of the behavior could be further defined by including more specificity of the criteria, e.g., "*to within 2 decimal places.*"

Note: The components described above are used when developing criterion referenced tests. Criterion-referenced assessments measure how well a student performs against an objective or criterion.

Refer to Table 3 for assistance in developing the correct “question cues” in categorizing [criterion referenced test] assessment questions when measuring student learning outcomes.

The cognitive domain (Table 1) comprises six levels, from the simple recall or recognition of facts, as the lowest level, through increasingly more complex and abstract mental levels, to the highest order, which is classified as evaluation. The six domains are: knowledge, comprehension, application, analysis, synthesis, and evaluation. The importance of the taxonomy of cognitive objectives in creating learning objectives is to sequence the order of instruction from the lower levels of cognition (knowledge, comprehension) to the higher levels (application, analysis, synthesis, evaluation). The cognitive domain divides cognitive objectives into subdivisions ranging from the simplest behavior to the most complex.

Continuum of Cognitive Domain Objectives



An analogy depicting the taxonomy of learning objectives can be thought as assembling blocks in building a pyramid. The knowledge level creates the basis for the foundation from which the high-level skills are built, as depicted in the illustration below.



This ensures the student has the knowledge and comprehension to demonstrate his/her abilities in achieving the desired learning outcomes in the performance of specific tasks or, in an education environment, the demonstration of the knowledge obtained. Therefore, stating learning objectives in a precise and clear format ensures the appropriate level of behavior has been achieved. They also provide a clear understanding of student expectations in achieving the desired learning outcomes. This greatly assists and enables the instructor to create assessment instruments to accurately measure and evaluate if the student has meet the criteria stated in the learning objectives.

Examples of Cognitive Learning Objectives

Knowledge level: Given a map of the United States (condition), the student (audience) will be able to list (behavior) the 50 states in 20 minutes (degree).

Comprehension level: Given examples and non-examples of constructivist activities in a college classroom (condition), the student (audience) will be able to identify (behavior) the constructivist examples and explain why each example is or isn't a constructivist activity in 20 words or less (degree).

Application level: Given a sentence written in the past or present tense (*condition*), the student (*audience*) will rewrite (*behavior*) the sentence in future tense with no errors in tense or tense contradiction (*degree*).

Synthesis level: Given two cartoon characters of the student's choice (*condition*), the student (*audience*) will be able to list (*behavior*) five major personality traits of each of the two characters, combine these traits (either by melding traits together, multiplying together complementary traits, or negating opposing traits) into a composite character, and develop a short (no more than 20 frames) storyboard for a cartoon that illustrates three to five of the major personality traits of the composite character (*degree*).

Note: As you move up the cognitive ladder, it becomes more difficult to precisely specify the degree. For a sample outline/template to assist in the development of instructionally sound learning objectives, refer to this URL: <http://www.nwlink.com/~donclark/hrd/templates/objectivetool.html>

Table 1: The Cognitive Domain of Objectives

(Clark, 1999; Huitt, 2000; Mager, 1999)

Learning Objective	Definition	Examples of verbs
Knowledge	The first level of learning is knowledge. Knowledge can be characterized as awareness of specifics and of the ways and means of dealing with specifics. The knowledge level focuses on memory or recall where the learner recognizes information, ideas, principles in the approximate form in which they were learned.	To arrange, to define, to describe, to identify, to list, to label, to name, to order, to recognize, to recall, to relate, to repeat, to reproduce, to state, to underline
Comprehension	Comprehension is the next level of learning and encompasses understanding. Has the knowledge been internalized or understood? The student should be able to translate, comprehend, or interpret information based on the knowledge.	To choose, to compare, to classify, to describe, to demonstrate, to determine, to discuss, to discriminate, to explain, to express, to identify, to indicate, to interpret, to label, to locate, to pick, to recognize, to relate, to report, to respond, to restate, to review, to select, to tell, to translate
Application	Application is the use of knowledge. Can the student use the knowledge in a new situation? It can also be the application of theory to solve a real world problem. The student selects, transfers, and uses data and principles to complete a problem or task.	To apply, to classify, to demonstrate, to develop, to dramatize, to employ, to generalize, to illustrate, to interpret, to initiate, to operate, to organize, to practice, to relate, to restructure, to rewrite, to schedule, to sketch, to solve, to use, to utilize, to transfer, to write
Analysis	Analysis involves taking apart a piece of knowledge, the investigation of parts of a concept. It can only occur if the student has obtained knowledge of and comprehends a concept. The student examines, classifies, hypothesizes, collects data, and draws conclusions.	To analyze, to appraise, to calculate, to categorize, compare, conclude, contrast, or criticize; to detect, to debate, to determine, to develop, distinguish, or deduce; to diagram, to diagnose, differentiate, or discriminate; to estimate, to examine, to evaluate, to experiment, to inventory, to inspect, to relate, solve, or test; to question
Synthesis	Synthesis is the creative act. It's the taking of knowledge and the creation of something new. It is an inductive process—one of building rather than one of breaking down. The student originates, integrates, and combines ideas into something that is new to him/her.	To arrange, to assemble, to collect, to compose, to construct, to constitute, to create, to design, to develop, to device, to document, to formulate, to manage, to modify, to originate, to organize, to plan, to prepare, to predict, to produce, to propose, to relate, to reconstruct, to set up, to specify, to synthesize, to systematize, to tell, to transmit, to write
Evaluation	Evaluation is judgment or decision-making. The student appraises, assesses or criticizes on a basis of specific standards and criteria.	To appraise, argue, or assess; to attach, to choose, to contrast, to consider, to critique, to decide, to defend, to estimate, to evaluate, to judge, to measure, to predict, to rate, to revise, to score, to select, to support, to standardize, to validate, to value, to test

Table 2: Definitions of Behavioral Verbs for Learning Objectives

(Kizlik, 2004)

APPLY A RULE: To state a rule as it applies to a situation, object or event that is being analyzed. The statement must convey analysis of a problem situation and/or its solution, together with the name or statement of the rule that was applied.

CLASSIFY: To place objects, words, or situations into categories according to defined criteria for each category. The criteria must be made known to the student.

COMPOSE: To formulate a composition in written, spoken, musical or artistic form.

CONSTRUCT: To make a drawing, structure, or model that identifies a designated object or set of conditions.

DEFINE: To stipulate the requirements for inclusion of an object, word, or situation in a category or class. Elements of one or both of the following should include: (1) the characteristics of the words, objects, or situations that are included in the class or category. (2) The characteristics of the words, objects, or situations that are excluded in the class or category.

DEMONSTRATE: The student performs the operations necessary for the application of a process, procedure, an instrument, model, device, or implement.

DESCRIBE: To name all of the necessary categories of objects, object properties, or event properties that are relevant to the description of a designated situation. Specific or categorical limitations, if any, may be given in the performance standards of each objective.

DIAGRAM: To construct a drawing with labels and with a specified organization or structure to demonstrate knowledge of that organization or structure. Graphic charting and mapping are types of diagramming, and these terms may be used where more exact communication of the structure of the situation and response is desired.

DISTINGUISH: To identify under conditions when contrasting identifications are involved for each response.

ESTIMATE: To assess the dimension of an object, series of objects, event or condition without applying a standard scale or measuring device. Logical techniques of estimation, such as are involved in mathematical interpolation, may be used. See MEASURE.

EVALUATE: To classify objects, situations, people, conditions, etc., according to defined criteria of quality. Indication of quality, if applicable, may be given in the defined criteria of each class category. Evaluation differs from general classification only in this respect.

IDENTIFY: To indicate the selection of an object [or objects] in response to its name, by pointing, picking up, underlining, marking, or other responses.

INTERPRET: To translate information from observation, charts, tables, graphs, and written material in a verifiable manner.

LABEL: To stipulate a verbal (oral or written) response to a given object, drawing, or composition that contains information relative to the known, but unspecified structure of these objects, drawings, or compositions. Labeling is a complex behavior that contains elements of naming and identifying.

LOCATE: To stipulate the position of an object, place, or event in relation to other specified objects, places, or events.

MEASURE: To apply a standard scale or measuring device to an object, series of objects, events, or conditions, according to practices accepted by those who are skilled in the use of the device or scale.

NAME: To supply the correct name, in oral or written form for an object, class of objects, persons, places, conditions, or events which are pointed out or described.

ORDER: To arrange two or more objects or events in accordance with stated criteria.

PREDICT: To use a rule or principle to predict an outcome or to infer some consequence. It is not necessary that the rule or principle be stated.

REPRODUCE: To imitate or copy an action, construction, or object that is presented.

SOLVE: To effect a solution to a given problem, in writing or orally. The problem solution must contain all the elements required for the requested solution, and may contain extraneous elements that are not required for solution. The problem must be posed in such a way that the student that the student is able to determine the type of response that is acceptable.

STATE A RULE: To make a statement that conveys the meaning of the rule, theory or principle.

TRANSLATE: To transcribe one symbolic form to another of the same or similar meaning.

Table 3: Assessing Learning Objectives Using Bloom’s Taxonomy

Bloom's Taxonomy provides a useful structure in which to categorize test questions when assessing student learning outcomes. The table below describes skills demonstrated for each level of thinking according to Bloom as well as question cues that can be used to elicit student responses within that level. The same content information can be assessed at different levels of cognition (Illinois Online Network, 2006). Follow the link for examples of test questions reflecting the six levels of learning according to Bloom: <http://www.ion.uillinois.edu/resources/tutorials/assessment/bloomtest.asp>. Also, to assist in the development of effective questioning techniques based on Bloom’s Cognitive taxonomy, refer to Saint Edward’s University Center for Teaching Excellence (<http://www.stedwards.edu/cte/content/category/13/27/51>) and their Task-Oriented Question Construction Wheel (<http://www.stedwards.edu/cte/media/BloomPolygon.pdf>).

Competence	Skills Demonstrated	Question Cues
Knowledge: To recall and memorize	Assessed by direct questions by testing the students' ability to recall facts, and identify and repeat the information provided. <ul style="list-style-type: none"> • observation and recall of information • knowledge of dates, events, places • knowledge of major ideas • mastery of subject matter 	list, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.
Comprehension: To translate from one form to another	Assessed by having students' restate material in their own words; reorder or extrapolate ideas, predict or estimate. Assessments provide evidence the students have some understanding or comprehension of what they are saying. <ul style="list-style-type: none"> • understanding information • grasp meaning • translate knowledge into new context • interpret facts, compare, contrast • order, group, infer causes • predict consequences 	summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend
Application: To apply or use information in a new situation	Assessed by presenting students with a new situation and have them apply their knowledge to solve the problem or execute the proper procedure. <ul style="list-style-type: none"> • use information • use methods, concepts, theories in new situations • solve problems using required skills or knowledge 	apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover
Analysis: To examine a concept and break it down into its parts	Assessed by presenting students with a unique situation of the same type but not identical to that used during instruction, and have them analyze the situation and describe the appropriate procedure or solution to the problem. <ul style="list-style-type: none"> • seeing patterns 	analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer

	<ul style="list-style-type: none"> • organization of parts • recognition of hidden meanings • identification of components 	
<p>Synthesis: To put information together in a unique or novel way to solve a problem</p>	<p>Assessed by presenting students with a unique situation NOT of the same type used during instruction, and have them solve a problem by selecting and using appropriate information.</p> <ul style="list-style-type: none"> • use old ideas to create new ones • generalize from given facts • relate knowledge from several areas • predict, draw conclusions 	<p>combine, integrate, modify, rearrange, substitute, plan, create, design, invent, compose, formulate, prepare, generalize, rewrite</p>
<p>Evaluation: To make quantitative or qualitative judgments using standards of appraisal</p>	<p>Assessed by presenting the students with a situation which includes both a problem and a solution to the problem and have them justify or critique the solution.</p> <ul style="list-style-type: none"> • compare and discriminate between ideas • assess value of theories, presentations • make choices based on reasoned argument • verify value of evidence • recognize subjectivity 	<p>assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize</p>

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