Quick Reference Guide To Developing Cognitive Learning Objectives

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Introduction

A learning event 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. Since learning objectives are developed from a knowledge/skill gap analysis identified in the front-end needs assessment process, the goal of creating learning objectives is to ensure the training/education and/or intervention 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. Clarifying your intended learning outcomes provides a basis for instructional planning and sets the stage for both teaching and assessment (Gronlund, 2009, p. 3). 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, L., & Carey, J.O., 2009).

"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., as cited in Penn State Learning Design Community Hub 2011). 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). *In other words, a well written and clearly articulated learning objective drives the desired learning behavior(s).*

Classification of Learning Objectives

Learning objectives can be categorized as either general or specific.

General Learning Objectives

The general objective is the first level of specification of the unit of instruction and states what the student should be able to accomplish at the end of the unit of study. It defines the outcome of the instructional unit and represents the general orientation of a course, lesson, or student performance (Gronlund, 2009). In other words, it "is a description of the intended results of the instructional process" (Mager, 1997, p.23).

Note: General objectives are sometimes referred to as Terminal Course Objectives (TCO), Terminal Learning Objectives, Terminal Performance Objectives, or simply Terminal Objectives. Each terminal objective is analyzed and broken down into smaller objectives that measure an element of the terminal objective. Terminal objectives represent performance at the task level and are normally derived

from a task and/or performance/knowledge gap analysis. To that end, a general learning objective must be further defined by a set of specific learning outcomes to clarify instructional intent (Gronlund, 2009, p. 13).

Specific Learning Objectives

Specific objectives are statements of the knowledge that has been stated in terms of specific and observable student performance. "Specific learning outcomes describe the types of performance that learners will be able to exhibit when they have achieved a general instructional objective" (Gronlund, 2009, p. 13), and is a detailed description of what students will be able to do when they complete a unit of instruction" or "at the end of the training program or at the end of a phase of training (Dick et al., 2009. p. 113). They describe the planned outcome of the training rather than the training process--results rather than procedures" (Write Better Behavioral Objectives, 1998, p.94).

Note: Specific learning objectives are often referred to as enabling objectives, performance objectives, instructional objectives, or behavioral objectives,

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. While these objectives are derived from the terminal objective, they are more specific and expressed in terms of the student and formulated in terms of observable behavior and the special conditions in which the behavior is manifested. They represent the "stepping stones" by which to attain the terminal objectives.

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, 2009)
- **Be Singular**. Should focus on one aspect of behavior
- **Be Realistic**. An instructional objective should focus on a specific, observable, and measurable behavior, not on teacher illusions or indefinable traits.

Note: The mnemonic SMART denotes *how* to write instructionally sound learning objective in that they should be: *Specific, Measurable, Achievable, Realistic and Timebound.*

Difference Between an Instructional Goal and a Terminal Objective

An instructional goal is a general statement of the intended outcome or overall purpose of an instructional unit or course and may not be easily measurable. An instructional goal represents the "big picture" view and in broad terms specifies what is expected of the student at the end of the learning activity. While an instructional goal statement describes a more global learning outcome, a learning objective is a statement of specific performances which contributes to the attainment of the goal. "When the instructional goal is converted to a performance objective, it is referred to as the terminal objective" (Dick, et.al, 2009, pp 113) and "for every unit of instruction that has a goal, there is a terminal objective" (pp 120). Note: The term learning outcomes are often used interchangeably with instructional goals in that they represent a broad performance statement which incorporates a wide range of knowledge, while objectives describe performance based on discrete and measurable behavior that focus on specific units of knowledge.

Difference Between a Terminal Objective and an Enabling Objective

Terminal objectives describe, in broad terms, what the learner's expected level of performance, competency, or knowledge must be at the end of a course, module, or lesson. Enabling objectives are derived from the terminal objective and are more detailed by defining the specific performance and/or knowledge of the learner. Enabling objectives define specific, measurable outcomes that must be mastered in order to satisfy the terminal objective. In a well designed unit of instruction, instructional goals, terminal objectives and enabling objectives are clearly stated and logically linked in a top-down fashion. They provide the foundation for the development and organization of the instructional content, learner activities, and assessments.

Difference Between Learning Objectives and Learning Outcomes

Learning Outcomes are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course or program. *Learning outcomes* identify what the *learner will know and be able to do by the end of a course or program*. *Learning* objectives are intended results or consequences of instruction, curricula, or programs, while learning outcomes are achieved results or consequences of what was learned. Objectives are focused on specific types of performances that students are expected to demonstrate at the end of instruction, while outcomes are more student-centered and describe what it is that the learner should learn (Assessment Primer: Goals, Objectives and Outcomes, n.d.).

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, appre-

ciations, 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 (Penn State Learning Design Community Hub, Psychomotor Domain taxonomy). 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.).

LEARNING OBJECTIVES BASED UPON BLOOM'S COGNITIVE DOMAIN

The purpose of a learning objective is to communicate, and a well-constructed learning objective should leave little room for doubt about what is intended. A well constructed learning objective describes an intended learning outcome (Kizlik, 2011). Instructionally sound learning objectives contain four components that comprise and identify each specific learning objective (Mager, 1984):

- the *audience* which is the *who* the objective is directed toward, i.e., the student, the associate, the medical technician, etc.
- 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 *behavioral* (performance) *verb* that defines the observable behavior itself
- the *degree* (criteria), to which a student must perform the behavior

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 an illustration, given a term, after a lecture/demonstration, after completing the reading*, etc.

The Behavior

The behavioral verb, commonly referred to as measurable performance verbs, (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. *Note: Nebulous and subjective terms such as know, understand, comprehend, learn, and knowledge are not measurable performance verbs.*

Note: When identifying the behavioral verb, it must be relevant to the expected performance that will result in the desired learning outcome. In other words, *the desired behavior (performance) must be mapped to the appropriate behavioral verb to attain the required learning outcome.*

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? "The information provided in the criterion is used to evaluate performance. Some of the criteria involve speed, accuracy with a margin of error, maximum amount of mistakes permitted, productivity level, and degree of excellence" (Write Better Behavioral Objectives, 1998, p.101). Other acceptable performance for degree/criterion would be a "time limit, range of accuracy, proportion of correct responses, and qualitative standards" (Smaldino, Lowther, & Russell, 2012, p 43, Figure 3.1). For example: *within a given period of time, such within 20 minutes; or, according to the information given in the text, lab manual, lecture;* according to the manufacturer's specifications; at a rate of three per hour; +/- 2 decimal points; *or, in accordance with recommendations of some external source.*

The criteria is a statement used to relay to the student how to "precisely" perform the intent of the performance verb, whereas "correctly" or with "accuracy" is implicit in the conditions and behavior and does not indicate the criteria. 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" that are assessed in a criterion referenced test (Dick et al., 2009, p. 118).

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", "+/- 2 degrees", etc.*

Note: Specifying a percentage (%) of accuracy as the degree/criteria statement does not convey to the learner how well the measurable performance verb is to be performed. Stating a percentage of accuracy is a subjective and ambiguous criterion which can result in different interpretations by the learner as to how well the measurable verb is to be performed.

Hint: "If the description of accuracy doesn't make any sense, per se, if it doesn't tell you *clearly* how well you must perform, it isn't a criteria. The number [% of accuracy] has to make sense, which means it has to refer to a *genuine performance* and it has to describe a limit to that performance" (p.127, Mager, 1997).

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.

> Sometimes an objective may not convey any real information, even though it may meet the formatting criteria for being an objective, i.e., it contains the necessary components (audience, behavior, condition, degree). For example, consider this objective: "Given a multiple-choice test, complete the test and achieve a score of at least nine out of ten correct." Although an exaggerated example, it can be referred to as a *universal objective* in the sense in that it appears to meet all of the criteria for being an objective and is applicable to almost any cognitive learning situation. It says nothing, however, in the terms of actual conditions or the behavior that is to be learned and evaluated. You should ensure your learning objectives are not universal objectives (Dick et al., 2009, p. 115).

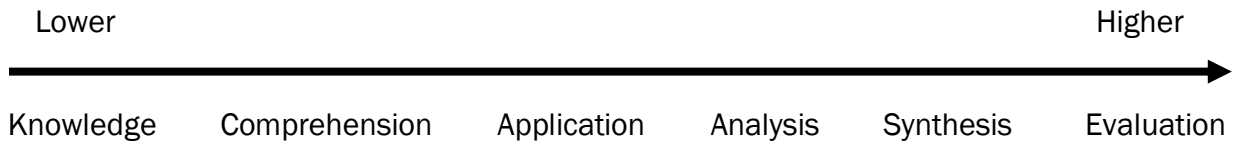
Hint: When designing learning objectives, relate the mnemonic ABCD to Who, What, Where, and How, specifically…

- the **A**udience is the **Who**, (e.g., the student, the associate, the technician, etc.)
- the **B**ehavior is the **What** (the measurable performance verb)
- the **C**ondition is the **Where** (the given the set of circumstances surround the objectives)
- the **D**egree is the **How** (how the measurable performance verb will be measured)

The Cognitive Domain

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 of Learning Objectives

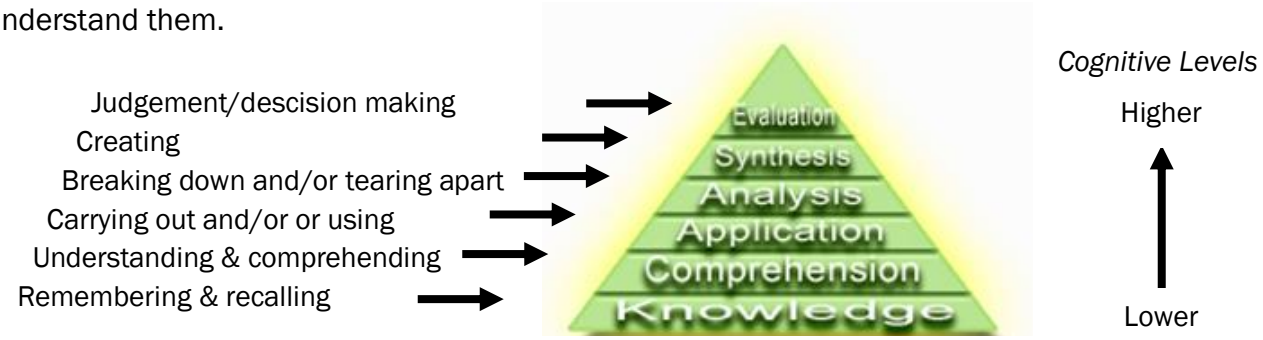


Simply put, Bloom's Taxonomy represents the process of learning, per se (Churches, 2009):

- Before one can *understand* a concept you have to *remember* it
- Before one can *apply* the concept you must *understand* it
- Before one *analyze* it you must be able to *apply* it
- Before one can *evaluate* its impact you must have *analyzed* it
- Before one can *create* you must have *remembered, understood, applied, analyzed,* and *evaluated*

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 higher-level skills are built, as depicted in the illustration below. In other words, one cannot *understand* a

concept if you do not remember it, likewise, one cannot *apply knowledge and concepts* if you do not understand them.



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 Learning Objectives

Knowledge level: Given the American Red Cross manual on First Aid, (*condition*), the emergency technician (*audience*) will list (*behavior*) the five steps of the CPR process in the order performed (*degree*).

Comprehension level: Given examples of constructivist activities in a college classroom (*condition*), the student (*audience*) will describe (*behavior*) the components of the constructivist examples in two paragraphs or less (*degree*).

Given a list of the first 100 numbers arranged in ascending order (*condition*), the math student (*audience*) will identify (*verb*) at least nine prime numbers (*criteria*).

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*).

Analysis level: Based upon Bloom's Taxonomy (*condition*), the teacher (*audience*) will differentiate (behavior) between the three domains by the identifying those unique components not shared by each domain (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

BLOOM'S REVISED TAXONOMY

During the 1990's, a new assembly was created for the purpose of updating Bloom's taxonomy, hoping to add relevance for 21st century students and teachers. This time "representatives of three groups [were present]: cognitive psychologists, curriculum theorists and instructional researchers, and

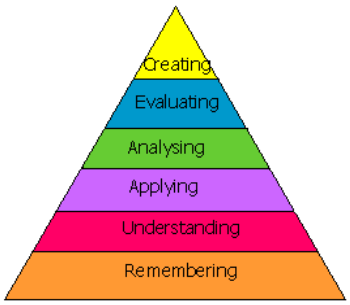
testing and assessment specialists" (Anderson, & Krathwohl, 2001, p. xxviii, as cited in Forehand, 2008). Published in 2001, the revision includes several minor yet significant changes. The revised taxonomy incorporates both the kind of knowledge to be learned (knowledge dimension) and the process used to learn (cognitive process), allowing for the instructional designer to efficiently align objectives to assessment techniques (Cruz, 2003).

Changes in terminology between the two versions were the most apparent differences in that Bloom's six major categories were changed from noun to verb forms. Additionally, the lowest level of the original, knowledge was renamed and became remembering. Finally, comprehension and synthesis were re-titled to understanding and creating (Forehand, 2008).

The new terms are defined as:

- **Remembering:** Retrieving, recognizing, and recalling relevant knowledge from long-term memory. *Can the learner recall or remember the information?* Remembering is when memory is used to produce definitions, facts or lists, or recite or retrieve material.
- **Understanding:** Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining. *Can the learner explain ideas or concepts?*
- **Applying:** Carrying out or using a procedure through executing, or implementing. Applying is related to and refers to situations where learned material is used through products like models, presentations, interviews and simulations. *Can the learner use the information in a new way, i.e., carrying out or using a procedure through executing or implementing?*
- **Analyzing:** Breaking material into constituent parts, determining how the parts relate to another and to an overall structure or purpose through differentiating, organizing, and attributing. Mental actions include differentiating, organizing and attributing as well as being able to distinguish between components. *Can the learner distinguish between the different parts?*
- **Evaluating:** Making judgments based on criteria and standards through checking and critiquing. *Can the learner justify a stand or decision?*
- **Creating:** Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing. *Can the learner create new product or point of view?*

In the original Taxonomy, the *Knowledge* category embodied both noun and verb aspects. The noun or subject matter aspect was specified in *Knowledge's* extensive subcategories. The verb aspect was included in the definition given to *Knowledge* in that the student was expected to be able to recall or recognize knowledge. This brought unidimensionality to the framework at the cost of a *Knowledge* category that was dual in nature and thus different from the other Taxonomic categories. This anomaly was eliminated in the revised Taxonomy by allowing these two aspects, the noun and verb, to form separate dimensions, the noun providing the basis for the Knowledge dimension and the verb forming the basis for the Cognitive Process dimension (Krathwohl, 2002, p. 213).



New Version (Overbaugh & Schultz, n.d.)

Among other modifications, Anderson and Krathwohl's revision of the original Bloom's taxonomy redefines the cognitive domain as the intersection of the Cognitive Process Dimension and the Knowledge Dimension. Iowa State University's Center for Excellence in Learning and Teaching offers a three-dimensional representation of the revised taxonomy of the cognitive domain. Although the Cognitive Process and Knowledge dimensions are represented as hierarchical steps, the distinctions between categories are not always clear-cut. For example, all procedural knowledge is not necessarily more abstract than all conceptual knowledge; and an objective that involves analyzing or evaluating may require thinking skills that are no less complex than one that involves creating. It is generally understood, nonetheless, that lower order thinking skills are subsumed by, and provide the foundation for higher order thinking skills (A Model of Learning Objectives, 2012).

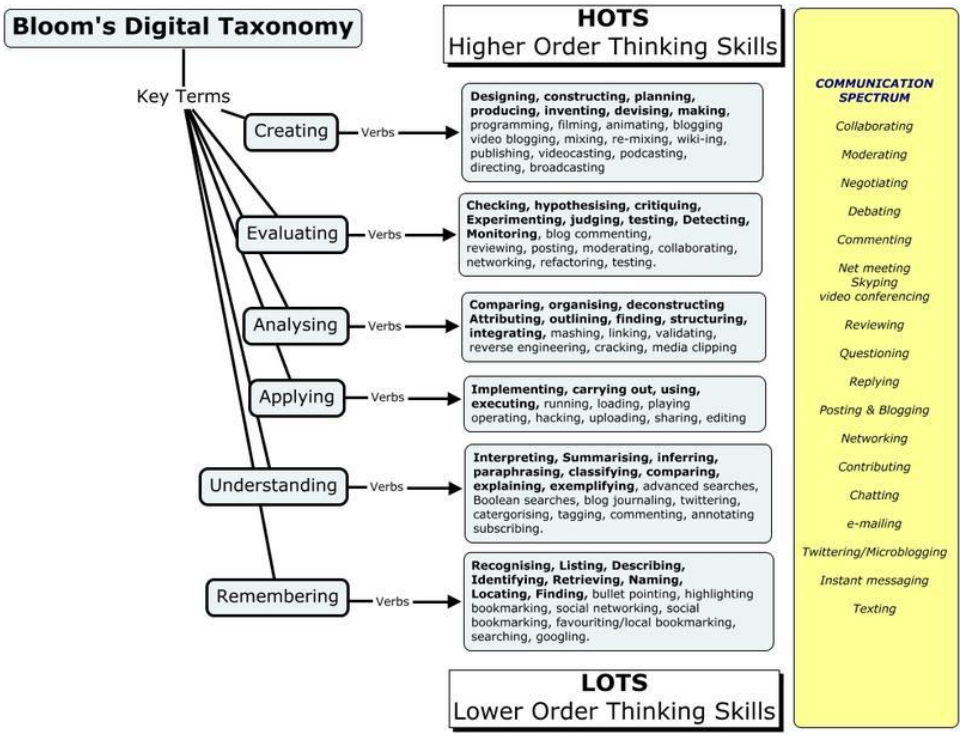
Reminder: A statement of a **learning objective** contains a verb (an action) and an object (usually a noun).

- The verb generally refers to [actions associated with] the intended cognitive process.
- The object generally describes the knowledge students are expected to acquire or construct.

BLOOM'S DIGITAL TAXONOMY

As more content moved to a digital, online format, a new digital version of Bloom's Taxonomy evolved. With the development of new instructional technology tools, different levels of learning evolved in ways that were not previously possible.This "update" to Bloom's Revised Taxonomy attempts to account for the new behaviors and actions emerging as technology advances and becomes more ubiquitous. Bloom's Revised Taxonomy describes many traditional classroom practices, behaviors and actions, but does not account for the new processes and actions associated with Web 2.0 technologies, the exponential growth in information, and the increasing ubiquitous personal technologies or cloud computing (Bloom's Digital Taxonomy, 2014).

Bloom's Digital Taxonomy focus is not on the tools or technologies but rather about using these to facilitate learning. Bloom's Digital Taxonomy lends itself to problem and project based learning where the student must work through the entire process of development and evaluation (Bloom's Digital Taxonomy, 2014). What Bloom's Digital Taxonomy to the table is a focus on new communication skills derived from the use of new web-based technologies. For example, collaboration is considered an essential Twenty-First Century skill and has become an increasingly important throughout the learning process. As depicted in the diagram below, in some taxonomic levels the collaboration verbs are included as an element of Bloom's Digital taxonomy and in other it is just a mechanism which can be use to facilitate higher order thinking and learning.



(Bloom's Digital Taxonomy, 2014)

Table 1: The Cognitive Domain of Learning 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 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.

EXPLAIN: To show the logical development or relationships; to make plain or clear; to make known in detail:

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.

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.

For information on how to write an assessment based upon a behaviorally stated learning objective, refer to Dr. Bob's Kizlik's (2014) webpage at http://adprima.com/assessment.htm.

Also, to assist in the development of effective questioning techniques based on Bloom's Cognitive taxonomy, refer to Saint Edward's University Bloom's Task-Oriented Question Construction Wheel (http://think.stedwards.edu/cte/sites/webdev1.stedwards.edu.cte/files/docs/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. • 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. • understanding information • grasp meaning • translate knowledge into new context • interpret facts, compare, contrast • order, group, infer causes • predict consequences	summarize, explain, interpret, contrast, predict, associate, distinguish, estimate, discuss
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. • 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. - seeing patterns - organization of parts - recognition of hidden meanings - identification of components	analyze, separate, order, differentiate, connect, classify, arrange, divide, compare, select, explain, infer
Synthesis: To put information together in a unique or novel way to solve a problem	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. - use old ideas to create new ones - generalize from given facts - relate knowledge from several areas - predict, draw conclusions	combine, integrate, modify, rearrange, substitute, plan, create, design, invent, compose, formulate, prepare, generalize, rewrite
Evaluation: To make quantitative or qualitative judgments using standards of appraisal	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. - compare and discriminate between ideas - assess value of theories, presentations - make choices based on reasoned argument - verify value of evidence - recognize subjectivity	assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize

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