

The Knowledge Dimension	The Cognitive Process Dimension					
	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual Knowledge						
Conceptual Knowledge						
Procedural Knowledge						
Meta-Cognitive Knowledge						

Source: Anderson, L. W., et al (2001). A taxonomy for learning, teaching, and assessing. New York: Longman.

Cognitive Process Dimension (Source: Anderson, L. W., et al, 2001)

Categories & Cognitive Process	Alternative Names	Definitions and Examples
Remember – Retrieve relevant knowledge from long-term memory		
- <i>Recognizing</i>	Identifying	Locating knowledge in long-term memory that is consistent with presented material (e.g. Recognize the dates of important events in US history)
- <i>Recalling</i>	Retrieving	Retrieving relevant knowledge from long-term memory (e.g. Recall the dates of important events in US history)
Understand – Construct meaning from instructional messages, including oral, written, and graphic communication		
- <i>Interpreting</i>	Clarifying, paraphrasing, representing, translating	Changing from one form of representation (e.g. numerical) to another (e.g. verbal) (e.g. Paraphrase important speeches and documents)
- <i>Exemplifying</i>	Illustrating, instantiating	Finding a specific example or illustration of concept/principle (e.g. Give examples of various artistic painting styles)
- <i>Classifying</i>	Categorizing, subsuming	Determining that something belongs to a category (e.g. concept or principle) (e.g., Classify observed or described cases of mental disorders)
- <i>Summarizing</i>	Abstracting, generalizing	Abstracting a general theme or major point(s) (e.g., Write a short summary of the events portrayed on a videotape)
- <i>Inferring</i>	Concluding, extrapolating, interpolating, predicting	Drawing a logical conclusion from presented information (e.g., In learning a foreign language, infer grammatical principles from examples)
- <i>Comparing</i>	Contrasting, mapping, matching	Detecting correspondences between two ideas, objects, and the like (e.g., Compare historical events to contemporary situations)
- <i>Explaining</i>	Constructing models	Constructing a cause-effect model of a system (e.g., Explain the causes of important 18 th century events in France)
Apply – Carry out or use a procedure in a given situation		
- <i>Executing</i>	Carrying out	Applying a procedure to a familiar task (e.g., Divide one whole number by another whole number, both with multiple digits)
- <i>Implementing</i>	Using	Applying a procedure to an unfamiliar task (e.g., Use Newton's Second Law in situations in which it is appropriate)

Cognitive Process Dimension (continued)

Categories & Cognitive Processes	Alternative Names	Definitions and Examples
Analyze – Break material into its constituent parts and determine how the parts relate to one another and to an overall structure or purpose		
- <i>Differentiating</i>	Discriminating, distinguishing, focusing, selecting	Distinguishing relevant from irrelevant parts or important from unimportant parts of presented material (e.g., Distinguish between relevant and irrelevant numbers in a mathematical word problem)
- <i>Organizing</i>	Finding coherence, integrating, outlining, parsing, structuring	Determining how elements fit or function within a structure (e.g., Structure evidence in a historical description into evidence for and against a particular historical explanation)
- <i>Attributing</i>	Deconstructing	Determine a point of view, bias, values, or intent underlying presented material (e.g., Determine the point of view of the author of an essay in terms of his or her political perspective)
Evaluate – Make judgments based on criteria and standards		
- <i>Checking</i>	Coordinating, detecting, monitoring, testing	Detecting inconsistencies or fallacies within a process or product; determining whether a process or product has internal consistency; detecting the effectiveness of a procedure as it is being implemented (e.g., Determine if a scientist's conclusions follow from observed data)
- <i>Critiquing</i>	Judging	Detecting inconsistencies between a product and external criteria, determining whether a product has external consistency; detecting the appropriateness of a procedure for a given problem (e.g., Judge which of two methods is the best way to solve a given problem)
Create – Put elements together to form a coherent or functional whole; reorganize elements into a new pattern or structure		
- <i>Generating</i>	Hypothesizing	Coming up with alternative hypotheses based on criteria (e.g., Generate hypotheses to account for an observed phenomenon)
- <i>Planning</i>	Designing	Devising a procedure for accomplishing some task (e.g., Plan a research paper on a given historical topic)
- <i>Producing</i>	Constructing	Inventing a product (e.g., Build habitats for a specific purpose)

The Knowledge Dimension (Source: Anderson, L. W., et al, 2001)

Major Types and Subtypes	Examples
Factual Knowledge – The basic elements students must know to be acquainted with a discipline or solve problems in it	
Knowledge of terminology	Technical vocabulary, music symbols
Knowledge of specific details and elements	Major natural resources, reliable sources of information
Conceptual Knowledge – The interrelationships among the basic elements within a larger structure that enable them to function together	
Knowledge of classifications and categories	Periods of geological time, forms of business ownership
Knowledge of principles and generalizations	Pythagorean theorem, law of supply and demand
Knowledge of theories, models, and structures	Theory of evolution, structure of Congress
Procedural Knowledge – How to do something, methods of inquiry, and criteria for using skills, algorithms, techniques, and methods	
Knowledge of subject-specific skills and algorithms	Skills used in painting with water colors, whole-number division algorithm
Knowledge of subject-specific techniques and methods	Interviewing techniques, scientific method
Knowledge of criteria for determining when to use appropriate procedures	Criteria used to determine when to apply a procedure involving Newton’s second law, criteria used to judge the feasibility of using a particular method to estimate business costs
Metacognitive Knowledge – Knowledge of cognition in general as well as awareness and knowledge of one’s own cognition	
Strategic knowledge	Knowledge of outlining as a means of capturing the structure of a unit of subject matter in a textbook knowledge of the use of heuristics
Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge	Knowledge of types of tests particular teachers administer, knowledge of the cognitive demands of different tasks.
Self-knowledge	Knowledge that critiquing essays is a personal strength, whereas writing essays is a personal weakness; awareness of one’s own knowledge level

Approaches to instruction (from Olson, Dorsey & Reigeluth, 1988)

Apprenticeship - an experiential learning strategy in which the learner acquires knowledge and skills through direct participation in learning under immediate personal supervision in a situation that approximates the conditions under which the knowledge will be used.

Debate - a formally structured discussion with two teams arguing opposing sides of a topic.

Demonstration - a carefully prepared presentation that shows how to perform an act of use a procedure; accompanied by appropriate oral and visual explanations and illustrations; frequently accompanied by questions.

Field trip - a carefully planned educational tour in which a group visits an object or place of interest for first-hand observation or study.

Game - an instructional activity in which participants follow prescribed rules that differ from those of reality as they strive to attain a challenging goal; is usually competitive.

Group discussion, guided - a purposeful conversation and deliberation about a topic of mutual interest among 6 - 20 participants under the guidance of a leader.

Group discussion, free/open - a free group discussion of a topic selected by the teacher, who acts only as chairman; learning occurs only through the interchange among members.

Ancient symposium - a group of 5 - 29 persons who meet in the home or private room to enjoy good food, entertainment, fellowship, and with the desire to discuss informally a topic of mutual interest.

Interview - a 5 to 30 minute presentation conducted before an audience in which a resource(s) responds to systematic questioning by the audience about a previously determined topic.

Laboratory - a learning experience in which students interact with raw materials.

Guided laboratory - an instructor-guided learning experience in which students interact with raw materials.

Lecture/Speech - a carefully prepared oral presentation of a subject by a qualified person.

Lecture, guided discovery - a group learning strategy in which the audience responds to questions posed by the instructor selected to guide them toward discovery (also called recitation class).

Panel discussion - a group of 3 - 6 persons having a purposeful conversation on an assigned topic before an audience of learners; members are selected on the basis of previously demonstrated interests and competency in the subject to be discussed and their ability to verbalize.

Project - an organized task performance or problem solving activity.

Team project - a small group of learners working cooperatively to perform a task or solve a problem.

Seminar - a strategy in which one or several group members carry out a study/project on a topic (usually selected by the teacher) and present their findings to the rest of the group, followed by discussion (usually teacher-led) of the findings to reach a general conclusion.

Quiet meeting - a 15 to 60 minute period of meditation and limited verbal expression by a group of five or more persons; requires a group of people who are not strangers to each other; is used at a point when the learners or members feel that reflection and contemplation are desirable.

Simulation - an abstraction or simplification of some specific real-life situation, process, or task.

Case study - a type of simulation aimed at giving learners experience in the sort of decision making required later.

Role play - a dramatized case study; a spontaneous portrayal (acting out) of a situation, condition, or circumstance by elected members of a learning group.

Think Tank/Brainstorm - a group effort to generate new ideas for creative problem solving; thoughts of one participant stimulate new direction and thoughts in another.

Tutorial, programmed - one-to-one method of instruction in which decisions to be made by the tutor (live, text, computer, or expert system) are programmed in advance by means of carefully selected, structured instructions; is individually paced, requires active learner response, and provides immediate feedback.

Tutorial, conversational - one-to-one method of instruction in which the tutor presents instruction in an adaptive mode; is individually paced, requires active learner response, and feedback is provided.

Socratic dialogue - a type of conversational tutorial in which the tutor guides the learner to discovery through a series of questions.

Note: There are many variations of these approaches, and different approaches are often used in combination.