TEACHING RESOURCES
UNDERSTANDING THE BLOOM'S TAXONOMY

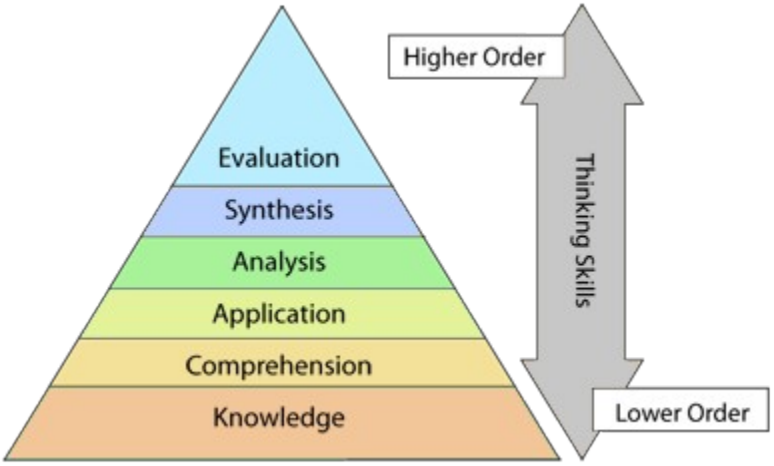
Bloom's Taxonomy of Learning

Take-home Messages

- **Bloom's Taxonomy is a hierarchical model that categorizes learning objectives into varying levels of complexity, from basic knowledge and comprehension to advanced evaluation and creation.**
- **Bloom's Taxonomy was originally published in 1956, and the Taxonomy was modified each year for 16 years after it was first published.**
- **Bloom's Taxonomy comprises three learning domains: cognitive, affective, and psychomotor. Within each domain, learning can take place at a number of levels ranging from simple to complex.**
- **After the initial cognitive domain was created, which is primarily used in the classroom setting, psychologists have devised additional taxonomies to explain affective (emotional) and psychomotor (physical) learning.**
- **In 2001, Bloom's initial taxonomy was revised to reflect how learning is an active process and not a passive one.**
- **Although Bloom's Taxonomy is met with several valid criticisms, it is still widely used in the educational setting today.**

What is Bloom's Taxonomy?

Bloom's Taxonomy is a system of hierarchical models (arranged in a rank, with some elements at the bottom and some at the top) used to categorize learning objectives into varying levels of complexity (Bloom, 1956).



You might have heard the word "taxonomy" in biology class before, because it is most commonly used to denote the classification of living things from kingdom to species.

In the same way that this taxonomy classifies organisms, Bloom's Taxonomy classifies learning objectives for students, from recalling facts to producing new and original work.

Development of the Taxonomy

Cognitive Domain
Concerned with thinking and intellect

The original version of the taxonomy, the cognitive domain, is the first and most common hierarchy of learning objectives (Bloom, 1956). It focuses on the acquisition and application of knowledge and is widely used in the educational setting.

This initial cognitive model relies on nouns, or more passive words, to illustrate the different educational benchmarks.

Because it is hierarchical, the higher levels of the pyramid are dependent on having achieved the skills of the lower levels.

The individual tiers of the cognitive model from bottom to top, with examples included, are as follows:

1. **Knowledge**: recalling information or knowledge is the foundation of the pyramid and a precondition for all future levels → Example: Name three common types of meat.

2. **Comprehension**: making sense out of information → Example: Summarize the defining characteristics of steak, pork, and chicken.
3. **Application**: using knowledge in a new but similar form → Example: Does eating meat help improve longevity?
4. **Analysis**: taking knowledge apart and exploring relationships → Example: Compare and contrast the different ways of serving meat and compare health benefits.
5. **Synthesis**: using information to create something new → Example: Convert an "unhealthy" recipe for meat into a "healthy" recipe by replacing certain ingredients. Argue for the health benefits of using the ingredients you chose as opposed to the original ones.
6. **Evaluation**: critically examining relevant and available information to make judgments → Example: Which kinds of meat are best for making a healthy meal and why?

Types of Knowledge

Although knowledge might be the most intuitive block of the cognitive model pyramid, this dimension is actually broken down into four different types of knowledge:

1. **Factual knowledge refers to knowledge of terminology and specific details.**
2. **Conceptual knowledge describes knowledge of categories, principles, theories, and structures.**
3. **Procedural knowledge encompasses all forms of knowledge related to specific skills, algorithms, techniques, and methods.**
4. **Metacognitive knowledge defines knowledge related to thinking -- knowledge about cognitive tasks and self-knowledge ("Revised Bloom's Taxonomy," n.d.).**

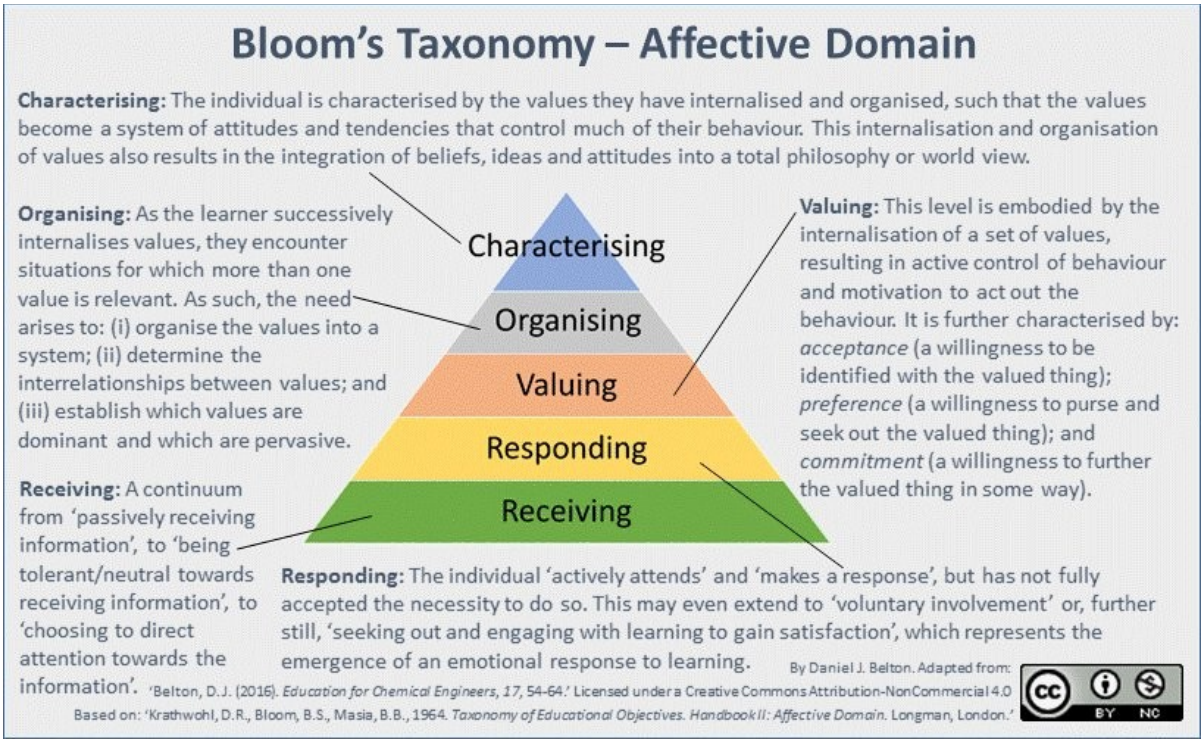
However, this is not to say that this order reflects how concrete or abstract these forms of knowledge are (e.g., procedural knowledge is not always more abstract than conceptual knowledge).

Nevertheless, it is important to outline these different forms of knowledge to show how it is more dynamic than one may think, and that there are multiple different types of knowledge that can be recalled before moving onto the comprehension phase.

And while the original 1956 taxonomy focused solely on a cognitive model of learning that can be applied in the classroom, an affective model of learning was published in 1964 and a psychomotor model in the 1970s.

The Affective Domain (1964)
Concerned with feeling and emotion

The affective model came as a second handbook (with the first being the cognitive model) and an extension of Bloom's original work (Krathwol et al., 1964).



This domain focuses on the ways in which we handle all things related to emotions, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes (Clark, 2015).

From lowest to highest, with examples included, the five levels are:

1. **Receiving**: basic awareness → Example: Listening and remembering the names of your classmates when you meet them on the first day of school.
2. **Responding**: active participation and reacting to stimuli, with a focus on responding → Example: Participating in a class discussion.
3. **Valuing**: the value that is associated with a particular object or piece of information, ranging from basic acceptance to complex commitment; values are somehow related to prior knowledge and experience → Example: Valuing diversity and being sensitive to other people's backgrounds and beliefs.
4. **Organizing**: sorting values into priorities and creating a unique value system with an emphasis on comparing and relating previously identified values → Example: Accepting professional ethical standards.

5. **Characterizing**: building abstract knowledge based on knowledge acquired from the four previous tiers; value system is now in full effect and controls the way you behave
   → Example: Displaying a professional commitment to ethical standards in the workplace.

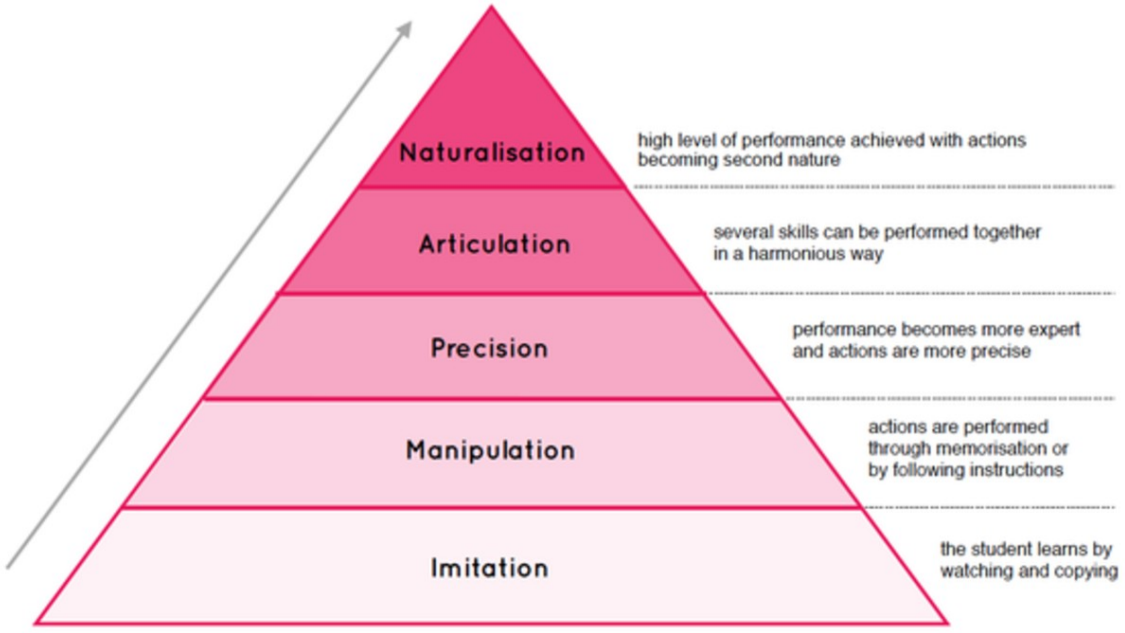
The Psychomotor Domain (1972)
Concerned with skilled behavior

The third and final domain of Bloom's Taxonomy is the psychomotor domain. The psychomotor model focuses on physical movement, coordination, and anything related to motor skills.

Mastery of these specific skills is marked by speed, precision, and distance. These psychomotor skills range from simple tasks, such as washing a car, to more complex tasks, such as operating an intricate piece of technological equipment.

As with the cognitive domain, the psychomotor model does not come without its modifications. This model was first published by Robert Armstrong and colleagues in 1970 and included five levels:

1) Imitation; 2) manipulation; 3) precision; 4) articulation; 5) naturalization. These tiers represent different degrees of performing a skill from exposure to mastery.



Two years later, Anita Harrow (1972) proposed a revised version with six levels:

1) reflex movements; 2) fundamental movements; 3) perceptual abilities; 4) physical abilities; 5) skilled movements; 6) non-discursive communication.

This model is concerned with the development of physical fitness, dexterity, agility, and body control and focuses on varying degrees of coordination from reflexes to highly expressive movements.

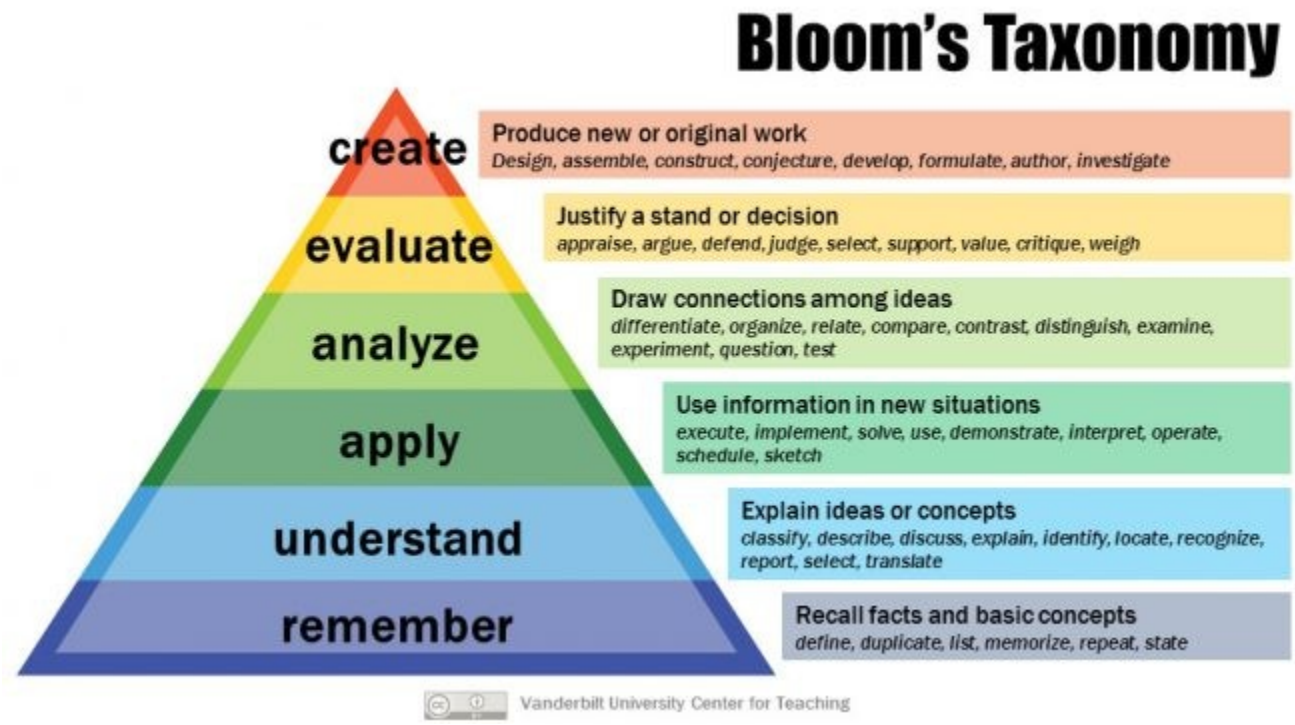
That same year, Elizabeth Simpson (1972) created a taxonomy that progresses from observation to invention.

The seven tiers, along with examples, are listed below:

1. **Perception**: basic awareness → Example: Estimating where a ball will land after its thrown and guiding your movements to be in a position to catch it.
2. **Set**: readiness to act; the mental, physical, and emotional mindsets that make you act the way you do → Example: Desire to learn how to throw a perfect strike, recognizing one's current inability to do so.
3. **Guided Response**: the beginning stage of mastering a physical skill. It requires trial and error → Example: Throwing a ball after observing a coach do so, while paying specific attention to the movements required.
4. **Mechanism**: the intermediate stage of mastering a skill. It involves converting learned responses into habitual reactions so that they can be performed with confidence and proficiency → Example: Successfully throwing a ball to the catcher.
5. **Complex Overt Response**: skillfully performing complex movements automatically and without hesitation → Example: Throwing a perfect strike to the catcher's glove.
6. **Adaptation**: skills are so developed that they can be modified depending on certain requirements → Example: Throwing a perfect strike to the catcher even if a batter is standing at the plate.
7. **Origination**: the ability to create new movements depending on the situation or problem. These movements are derived from an already developed skill set of physical movement's → Example: Taking the skill set needed to throw the perfect fastball and learning how to throw a curveball.

The Revised Taxonomy (2001)

In 2001, the original cognitive model was modified by educational psychologists David Krathwol (with whom Bloom worked on the initial taxonomy) and Lorin Anderson (who was a previous student of Bloom's!) and published with the title *A Taxonomy for Teaching, Learning, and Assessment*.



This revised taxonomy emphasizes a more dynamic approach to education, as opposed to shoehorning educational objectives into fixed, unchanging spaces.

To reflect this active model of learning, the revised version utilizes verbs to describe the active process of learning and does away with the nouns used in the original version (Armstrong, 2001).

The figure below illustrates what words were changed as well as a slight adjustment to the hierarchy itself (evaluation and synthesis were swapped). Together, the cognitive, affective, and psychomotor models make up Bloom's Taxonomy.

How Bloom's can Aid in Course Design

Thanks to Bloom's Taxonomy, teachers across the nation have a tool to guide the development of assignments, assessments, and overall curricula.

This model helps teachers identify the key learning objectives they want a student to achieve for each unit because it succinctly details the process of learning.

The taxonomy explains that 1) before you can understand a concept, you need to remember it; 2) to apply a concept, you need to first understand it; 3) to evaluate a process, you need to first analyze it; 4) to create something new, you need to have completed a thorough evaluation (Shabatura, 2013).

This hierarchy takes students through a process of synthesizing information that allows them to think critically. Students start with a piece of information and are motivated to ask questions and seek out answers.

Not only does Bloom's Taxonomy help teachers understand the process of learning, but it also provides more concrete guidance on how to create effective learning objectives.

Bloom's Level	Key Verbs (keywords)	Example Learning Objective
Create	design, formulate, build, invent, create, compose, generate, derive, modify, develop.	*By the end of this lesson, the student will be able to design an original homework problem dealing with the principle of conservation of energy.*
Evaluate	choose, support, relate, determine, defend, judge, grade, compare, contrast, argue, justify, support, convince, select, evaluate.	By the end of this lesson, the student will be able to determine whether using conservation of energy or conservation of momentum would be more appropriate for solving a dynamics problem.
Analyze	classify, break down, categorize, analyze, diagram, illustrate, criticize, simplify, associate.	*By the end of this lesson, the student will be able to* differentiate between potential and kinetic energy.
Apply	calculate, predict, apply, solve, illustrate, use, demonstrate, determine,	*By the end of this lesson, the student will be able to* calculate the kinetic

Bloom's Level	Key Verbs (keywords)	Example Learning Objective
	model, perform, present.	energy of a projectile.
Understand	describe, explain, paraphrase, restate, give original examples of, summarize, contrast, interpret, discuss.	*By the end of this lesson, the student will be able to* describe Newton's three laws of motion to in her/his own words
Remember	list, recite, outline, define, name, match, quote, recall, identify, label, recognize.	*By the end of this lesson, the student will be able to* recite Newton's three laws of motion.

The revised version reminds teachers that learning is an active process, stressing the importance of including measurable verbs in the objectives. And the clear structure of the taxonomy itself emphasizes the importance of keeping learning objectives clear and concise as opposed to vague and abstract (Shabatura, 2013).

Bloom's Taxonomy even applies at the broader course level. That is, in addition to being applied to specific classroom units, Bloom's Taxonomy can be applied to an entire course to determine what the learning goals of that course should be.

Specifically, lower level introductory courses that are typically geared towards freshmen will target Bloom's lower order skills as students build foundational knowledge.

However, that is not to say that this is the only level that is incorporated, but you might only move a couple rungs up the ladder into the applying and analyzing stages.

On the other hand, upper level classes don't place as much emphasis on remembering and understanding because students in these courses have already mastered this skill.

As a result, these courses focus instead on higher order learning objectives such as evaluating and creating (Shabatura, 2013). In this way, professors can reflect upon what type of course they are teaching and refer to Bloom's Taxonomy to determine what they want the overall learning objectives of the course to be.

Having these clear and organized objectives allows teachers to plan and deliver appropriate instruction, design valid tasks and assessments, and ensure that such instruction and assessment actually aligns with the outlined objectives (Armstrong, 2010).

Overall, Bloom's Taxonomy helps teachers teach and helps students learn!

Critical Evaluation

Bloom's Taxonomy accomplishes the seemingly daunting task of taking the important and complex topic of thinking and giving it a concrete structure.

The taxonomy continues to provide teachers and educators with a framework for guiding the way they set learning goals for students and how they design their curriculum.

And by having specific questions or general assignments that align with Bloom's principles, students are encouraged to engage in higher order thinking.

However, even though it is still used today, this taxonomy does not come without its flaws. As mentioned before, the initial 1956 taxonomy presented learning as a static concept. Although this was ultimately addressed by the 2001 revised version that included active verbs to emphasize the dynamic nature of learning, Bloom's updated structure is still met with multiple criticisms.

Many psychologists take issue with the pyramid nature of the taxonomy. The shape creates the false impression that these cognitive steps are discrete and must be performed independent of one another (Anderson & Krathwol, 2001).

However, the vast majority of tasks require several cognitive skills to work in tandem with each other. In other words, a task will not be only an analysis or only a comprehension task. Rather, they occur simultaneously as opposed to sequentially.

The structure also makes it seem like that some of these skills are more difficult and more important than others. However, when people adopt this mindset, it causes less of an emphasis to be placed on knowledge and comprehension, which are as, if not more, important that the processes towards the top of the pyramid.

Additionally, author Doug Lemov (2017) argues that this contributes to a national trend that devalues the importance of knowledge. He goes even further to say that lower income students who have less exposure to sources of information suffer from a knowledge gap in schools.

A third problem with the taxonomy is that the sheer order of elements is inaccurate. When we learn, we don't always start with remembering and then move onto comprehension and through to creating something new. Instead, we mostly learn by applying and creating.

For example, you don't really know how to write an essay until you actually do it. And you might not know how to speak Spanish until you actually do it (Berger, 2020).

The act of doing is where the learning lies, as opposed to moving through a regimented, linear process. Despite these several valid criticisms of Bloom's Taxonomy, this model is still widely used today.