4 Approaches to Learning Taxonomies

Bloom's Taxonomy

Knowledge	Involves the recall of specific facts and universals or the recall of patterns, settings, or methods.
Comprehension	Represents the lowest level of understanding. The individual understands what is being communicated and can make use of it in some way.
Application	The use of abstractions in concrete situations to solve new problems.
Analysis	The breakdown of a situation into its component parts so that a set of ideas is made clear.
Synthesis	Putting together the elements of a situation such that they can form a whole.
Evaluation	Marking judgments about the value of methods and materials for given purposes.

Van Hiele Levels

Visualization	Recognize figures by their global appearance. Do not identify the properties of the figures.
Analysis	Analyze properties of the figures. "Rectangles have equal diagonals and a rhombus has all equal sides," but they do not explicitly interrelate the figures.
Informal Deduction	Relate figures and their properties "every square is a rectangle," but they do not organize statements to justify observations.
Formal Deduction	Develop sequences of statements to deduce one statement from another, such as showing how in the parallel postulate that the angle sum of a triangle is 180 degrees.
Rigor	Analyze various deductive systems with a high degree of rigor. Understand such properties as consistency and independence.

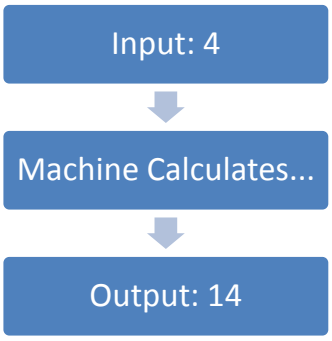
Berliner Stages

Novice	Here, the commonplace must be discerned. The elements of the task must be labeled and learned, and one learns a set of context-free rules to guide behavior.
Advanced Beginner	Here, experience can become melded with verbal knowledge; similarities across contexts are recognized and episodic knowledge built up. Strategic knowledge (when to ignore the rules or break them and when to follow them) is developed.
Competent	Competent performers of a skill have two characteristics which distinguish them. First, they make conscious choices about what they are going to do. Secondly, they set priorities and decide on a plan. Because of this, competent performers feel a sense of responsibility for their emotional satisfaction from their efforts.
Proficient	At this stage, intuition or know-how comes into play. This is not mysterious. The skill becomes much like riding a bicycle with the many micro-adjustments make every minute. At some point, you no longer think about the task.
Expert	Experts are almost “irrational” in their performance. They no longer “think” about what to do but perform in a fluid manner. They are beyond intuition. Their timing is perfect. Essentially, the become part of the skill they are performing.

Structure of Learned Outcomes (SOLO)

Prestructural	Inability or refusal to become engaged in the problem
Unistructural	The response takes note of only direct relationship of fact
Multistructural	Able to handle multiple operations with a series of closures
Relational	Relates elements within the immediately available concrete system
Extended Abstract	The response is marked by an acceptance of a lack of closure, an ability to do work with multiple interacting and abstract systems

This is a machine that changes numbers. It adds the number you put in three times and then adds 2 more. So if you put in 4, it put out 14.



U. If 14 is put out, what number was put in?
M. If we put in a 5, what number will the machine put out?
R. If we got out a 41, then what was put in?
E. If *x* is the number that comes out of the machine when the number *y* is put in, write down a formula that will give us the value of *y* whatever the value of *x*.

Figure 2. A superitem to reflect the SOLO taxonomy.

For this item, we intended that in order to obtain a correct answer, the student would need to process the information in the stem in at least the following ways:

U (Answer: 4). One piece of information is used, one closure is required, and the information is obtainable from either the last sentence in the stem or the diagram – unistructural response level.

M (Answer: 17). All of the information is used in a sequence of discrete closures; the stem is seen as a set of instructions to be followed in order – multistructural response level.

R (Answer: 13). All of the information is used, but in addition, the student has to extract the "principle" involved in the problem well enough to be able to use it in reverse; the student needs an overview of the instructions in the stem to carry out the appropriate operations – relational response level.

E (Answer: $y = \frac{x-2}{3}$). The student has to extract the abstract general principle from the information and write it in its abstract form, which involves dismissing distracting cues, perhaps forming hypotheses and testing them, and zeroing in on the relationships involved – extended abstract response level.

Article adapted from information obtained from Dr. Chuck Dzuiban, RITE, UCF, 2011