

Higher Level Thinking

Higher level thinking involves logical thinking and reasoning and includes skills such as comparison, classification, sequencing, cause/effect, patterning, webbing, analogies, deductive and inductive reasoning, forecasting, planning, hypothesizing, and critiquing.

This article focuses on the cognitive domain of Dr. Benjamin Bloom's original taxonomy (1956) and his revised taxonomy (Anderson & Krathwohl, 2001) as both are a convenient means of talking about higher-level thought processes.

Bloom's taxonomy categorizes thinking skills from the concrete to the abstract. The lowest three levels of Bloom's cognitive domain taxonomy are: knowledge / remembering, comprehension / understanding, and application / applying. The highest three levels are: analysis / analyzing, synthesis / evaluating, and evaluation / creating. The last three are considered higher-order skills. The lower levels require less in the way of thinking skills. As one moves up the hierarchy, the processes require higher level thinking skills.

Original taxonomy:

- **Analysis:** seeing patterns, organization of parts, recognition of hidden meanings, and identification of components.
Processes: analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer.
- **Synthesis:** use old ideas to create new ones, generalize from given facts, relate knowledge from several areas, predict, and draw conclusions.
Processes: combine, integrate, modify, rearrange, substitute, plan, create, design, invent, what if?, compose, formulate, prepare, generalize, rewrite.
- **Evaluation:** compare and discriminate between ideas, assess value of theories, presentations, make choices based on reasoned argument, verify value of evidence, recognize subjectivity.
Processes: assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize.

Revised taxonomy:

- **Analyzing:** Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing.
- **Evaluating:** Making judgments based on criteria and standards through checking and critiquing.
- **Creating:** Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing.

Bloom's taxonomy is organized in a hierarchical way to organize information from basic factual recall to higher order thinking.

It is important that teachers are aware that children are developing competencies as higher level thinkers. This being the case, teachers need to (1) purposely teach higher order thought processes via the tasks and discussions they have in class (2) provide in-class opportunities to engage in higher order thinking tasks and (2) modify, accept, or/and change curriculum expectations accordingly.

The challenge for teachers is to constantly assess children's higher level thinking comprehension and application. Teachers need to ensure that discussions etc are not focusing on the lower thinking levels yet tasks and projects are geared at the higher thinking levels.

The question is not whether or not someone is an effective teacher based on whether they use a taxonomy. The question is how much better might they be if they consciously attended to levels of thinking as they designed activities and asked questions. Bennett and Rolheiser 2001

In order to foster a climate conducive to the development of thinking skills teachers need to model thinking skills, employ a wide variety of teaching modalities, provide well planned activities, empower students to be active participants in their own learning, remain respectful, exhibit a positive attitude, and acknowledge student responses.

Instructional approaches found to promote thinking skill development include redirection, probing, and reinforcement; asking higher-order questions during classroom discussions, and lengthening wait-time during classroom questioning.

BLOOM'S TAXONOMY

Evaluation

Evaluation - judging outcomes

Evaluation: ability to judge value for purpose; base on criteria; support judgment with reason. (No guessing).



Synthesis

Synthesis - putting things together in another way

Synthesis: ability to put parts together to form a new whole; unique communication; set of abstract relations.



Analysis

Analysis questions - taking apart the known

Analysis: breaking down into parts; understanding organization, clarifying, concluding.



Application

Application - making use of the knowledge

Application: ability to use learned material in a new situation; apply laws, methods, theories.



Comprehension

Comprehension - understanding

Comprehension: grasping the meaning of material; interpreting (explaining or summarizing); predicting outcome and effects (estimating future trends).



Knowledge

Knowledge - finding out

Knowledge: remembering of previously learned material; recall (facts or whole theories); bringing to mind.



BLOOM'S REVISED TAXONOMY

Creating

Generating new ideas, products, or ways of viewing things
Designing, constructing, planning, producing, inventing.



Evaluating

Justifying a decision or course of action

Checking, hypothesising, critiquing, experimenting, judging



Analysing

Breaking information into parts to explore understandings and relationships

Comparing, organising, deconstructing, interrogating, finding



Applying

Using information in another familiar situation
Implementing, carrying out, using, executing



Understanding

Explaining ideas or concepts

Interpreting, summarising, paraphrasing, classifying, explaining



Remembering

Recalling information

Recognising, listing, describing, retrieving, naming, finding

