Pacific Crest
Faculty Development Series

Bloom's Taxonomy—Expanding its Meaning

by Paula Bobrowski, Auburn University

This module expands the usefulness of Bloom's taxonomy beyond its original intent of clarifying educational objectives to help faculty prepare better-designed courses, achieve more student-centered implementation, and establish outcomes-oriented evaluation criteria. Bloom's taxonomy is explored from a historical perspective and examined for its applications in Process Education. Pacific Crest's adaptation of Bloom's taxonomy includes five different "levels of learner knowledge." Each of these is defined and illustrated with key words and questions for use in designing curriculum and instructional materials.

A Description of Bloom's Taxonomy and its Significance

Educational objectives indicate what students should attend to and put effort into learning; they are "explicit formulations of the ways in which students are expected to be changed by the educative process" (Bloom, 1956, p. 26). Bloom's taxonomy provides a well-accepted pedagogical framework for classifying vast numbers of educational objectives into useful structures. Benjamin Bloom's pioneering work on learning was initiated in 1948, when he headed a team of educators and psychologists investigating three major learning domains: cognitive, affective, and psychomotor. Over the last half-century, the theoretical framework produced by this team has facilitated analyses of learning objectives classification, criteria for performance-based learning, and levels of mastery in learning (Simon, 2000).

To the extent that the goal of education is the diffusion of knowledge through learning, a description of Bloom's taxonomy represents a seminal work in developing and implementing high quality instruction. There are six different levels in the cognitive domain of factual and conceptual knowledge progressing from elementary to complex. As demonstrated in Table 1, the levels include knowledge, comprehension, application, analysis, synthesis and evaluation.

Table 1 ***Description of Bloom's Taxonomy of Educational Objectives***

Knowledge of terminology, specific facts, ways and means of dealing with specifics, conventions, trends and sequences, classifications and categories, criteria, methodology, abstractions in a field, principles and generalizations, and theoretical structures.
Comprehension in translation, interpretation, and extrapolation.
Application of concepts in the use of abstraction in particular and in concrete situations.
Analysis of elements, relationships, and organizational principles.
Synthesis of ideas in the production of unique communications and plans.
Evaluation leading to judgments about the value of materials and methods for given purposes.

Evolution of Bloom's Taxonomy

Over the past 40 years Bloom's work has been translated into more than twenty languages and has provided a basis for test design and curriculum development. Many modern interpretations of Bloom's taxonomy are found in the literature. Recently Anderson and Krathwohl (2001) expanded the single dimension of the original taxonomy into a two-dimensional framework consisting of factual/conceptual knowledge and cognitive processes. High quality educational objectives combine both elements as seen in the following example: "The student will learn to distinguish (cognitive process) among confederate, federal, and unitary systems of government (knowledge)." Apple and Krumsieg (2001) clarified some of the definitions found in the original taxonomy by viewing it in terms of transferable knowledge that progresses in complexity through the six levels. The most basic level, using Apple and Krumsieg's labels, involves information (knowledge in Bloom), followed by knowledge (comprehension), knowledge skill (application), problem solution (analysis), new knowledge (synthesis), and finally evaluation (peer-reviewed knowledge). This model of learning has supported the development of a learning process methodology for efficiently and effectively advancing the level of student knowledge (Krumsieg & Baehr, 2000).

There is also extensive educational research aimed at moving beyond the cognitive domain in formal education by focusing more attention on the affective and psychomotor domains (Shank 1994; Tinto, 1993; Bobrowski & Molinari, 1992). Although this is not the focus of this module, it is important to be aware of these developments. Tinto (1993) and Shank (1994) have published significant works in this area, arguing that academics must change the way

teaching is performed, by paying special attention to the intrapersonal and interpersonal contexts of learning. Tinto examined learning communities in depth, while Shank promotes the perspective that the only way learning occurs is "by doing."

Levels of Learner Knowledge

Bloom's taxonomy has been adapted and transformed by Apple and Krumsieg (2001). According to their Learning Process Methodology, five levels of learner knowledge are observable in college classrooms. These are defined in Table 2 and represent increasing complexity in the way students formulate, connect, and present their thoughts. Information acquisition occupies the lowest level and is typified by memorization of information. Conceptual understanding represents the next higher level and is the result of combining information elements to achieve understanding and meaning. Application is the ability to apply knowledge in a new context. Working expertise is the ability to understand the logical constructs and apply knowledge without expert prompting. Research is the goal of graduate study and is the ability to create novel discoveries from basic elements and logical constructs. The "evaluation level" in Bloom is considered separately as part of assessment, which can take place at any level.

Brookfield (1987) argues that learning is promoted by asking questions that challenge students' understanding at the appropriate level. Good questions can also stimulate students' curiosity and allow the teacher to probe current understanding as well as assess the effectiveness of past instructional activities (Eggen & Kauchak, 1988). Inquiry as a learning method requires active participation both by the students and teachers. For this reason, Table 2 integrates Barton's (1997) hierarchy of critical thinking questions with the levels of learner knowledge. The combination of these two concepts creates a useful tool for teachers to use in classroom applications. It provides key words and questions that are appropriate to ask students at each level of learning and demonstrates the link with Bloom's taxonomy of educational objectives.

Classroom Application

Questions and key words in Table 2 can be used to set performance criteria for learning activities, to verify pre-requisite knowledge, and to measure achievement against learning outcomes. Prompts in this table also provide guidance on which thinking skills are most developmentally appropriate for cultivation and suggest possible avenues to challenge students at the next higher-level of knowledge. For example, introducing methodologies and studying their elements at Levels One and Two is a particularly effective way to accelerate the creation of transferable knowledge at Levels Three and Four.

Fundamental to all aspects of educational processes is the knowledge that results from experiencing applications of knowledge. To gain additional insights into the connections between the learning process and Bloom's taxonomy, see the modules ***Classification of Learning Skills***, and ***Learning Processes through the Use of Methodologies***. These modules clarify the role of educators in building stronger transferable skills at increasingly higher levels of learning.

Concluding Thoughts

This module provides an overview of Bloom's taxonomy and subsequent work, which offers a rational and holistic approach to defining academic quality. Table 2 is designed around Bloom's levels of knowledge model to help illuminate appropriate teaching/learning processes for different performance capabilities and to focus attention on the detail that is expected of students in order to accomplish learning objectives. The related components of the table will help faculty ask better questions, define clearer expectations for assignments, and compose exam questions that are matched to specific levels of learning outcomes.

References

Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). *A taxonomy for learning, teaching and assessing.* New York: Longman.

Apple, D. K., & Krumsieg, K. (2001). *Teaching institute handbook.* Lisle, IL: Pacific Crest.

Barton, L. G. (1997). *Quick flip questions for critical thinking.* San Clemente, CA: Edupress.

Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Taxonomy of educational objectives: The classification of educational goals. Handbook 1: Cognitive domain.* New York: David McKay.

Bobrowski, P. E., & Molinari J. (2000). Empirical study of simulation: The pedagogical value in marketing education. *Journal of Business Education, 1,* 80-96.

Brookfield, S. (1987). *Developing critical thinkers: Challenging adults to explore alternative ways of thinking and acting.* San Francisco: Jossey Bass.

(continued)

Table 2

Levels of Learner Knowledge

Level I Information **Bloom's Level 1: Knowledge**	— The learner can talk about a concept, process, tool, or context in words and can provide definitions or descriptions. — The learner has some sense of what information is relevant and not relevant. — Limited comprehension makes it difficult for the learner to carry on an extensive dialog.	
Key Words	*who, what, where, when, which, find, choose, define, list, label, show, spell, match name, tell, recall, select, organize, outline*	
Questions	What is…? Where is…? When did…? What facts or ideas show…? Who were the main…?	Which one…? Can you recall…? Can you select…? Can you list the three …? Who was…?
Level II Conceptual Understanding **Bloom's Level 2: Comprehension**	— The learner is able to construct a strong degree of comprehension about a concept, process, tool, or context. — Information and relationships have been processed so that the learner can construct an appropriate model in his or her mind pertaining to the particular item of knowledge. — The learner can process answers to critical-inquiry questions and articulate what he or she understands as well as what remains confusing. — The learner also has some understanding as to how the item of knowledge is linked to other forms within his or her knowledge base.	
Key Words	*relate, compare, contrast, how, illustrate, translate, infer, demonstrate, summarize, interpret, show, explain, classify, select, rephrase, why*	
Questions	How did… happen? How would you compare or contrast…? How would you describe…? How would you summarize…? How would you show an understanding of…?	How would you state or interpret in your own words…? What is the main idea of…? Which statements support…? Can you explain what is happening…? What is meant by…?
Level III Application **Bloom's Level 3: Application**	— The learner has the skill to apply and transfer the particular item of knowledge to different situations and contexts. — The learner has taken the time to generalize the knowledge to determine ways to apply it, testing boundaries and linkages to other information. — The learner can recognize new contexts and situations to skillfully make use of this knowledge. — The learner is able to teach this knowledge to others; "knowing he or she knows" rather than just "thinking he or she knows."	
Key Words	*apply, construct, make use of, plan, build, develop, model, interview, experiment with, identify*	
Questions	How would you use…? What examples can you find to…? What would result if…? Can you make use of the knowledge to…? What approach would you use to…?	How would you apply what you learned to develop…? What other way would you plan to…? How would you structure an argument to show…? What elements would you choose to change…? What questions would you ask in an interview with…?

table continues on next page

Table 2 (continued)

Level IV Working Expertise **Bloom's Levels 4 & 5: Analysis and Synthesis**	— The learner has the ability to integrate application knowledge with other skills to perform in an expert fashion. — The learner is able to solve complex problems by applying and generalizing multiple concepts, processes, and tools to produce a quality problem solution. — The learner has the ability to produce a general problem solution which can be reused and transferred to similar situations with minimal adjustments. — Defines an "expert" in a particular field.	
Key Words	*analyze, dissect, inspect, model relationships, divide, simplify, solve, test for, connects function, making and testing assumptions, examine, applying a design, creating themes, improving*	
Questions	What motive is there…?	What inference can you make…?
	What ideas justify…?	What conclusions can you draw…?
	What changes would you make to solve…?	What is the function of…?
	What would happen if…?	How would you solve….using what you've learned….?
	Can you propose an alternative…?	Can you construct a model that would change…?
Level V Research **Bloom's Level 6: Evaluation**	— The learner has innovative expertise which can be used to develop new understanding. — Through the use of lateral thinking the learner makes new linkages among concepts and problem solutions, which have not been seen before. — The learner knows how to validate and test his or her assumptions and hypotheses to build reliability in the knowledge structure. — The learner knows how to communicate this understanding to others so it can be shared as common knowledge.	
Key Words	*theorize, design, formulate, discover, make up, hypothesize, prove, disprove, invent, create an original work*	
Questions	Can you formulate a theory for…?	How feasible is the plan to…?
	Can you think of an original way to ….?	Can you create a design to…?
	How would you prove…? Disprove…?	Can you predict the outcome if…?
	Should you accept the hypothesis that…?	Can you publish your findings…?
	How would you estimate the results for…?	What is necessary to discover…?

References *(continued)*

Eggen, P., & Kauchak D. (1988). *Strategies for teachers*. Englewood Cliffs, NJ: Prentice-Hall.

Krumsieg, K., & Baehr, M. (2000). *Foundations of learning* (3rd ed.). Lisle, IL: Pacific Crest.

Shank, G. (1994). Shaping qualitative research in educational psychology. *Contemporary Educational Psychology, 19*, 340-35.

Simon, N. (2000). Managing the CI department: Cognition and performance. *Competitive Intelligence Magazine, 3,* 53-56.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago: University of Chicago Press.