

Critical Thinking and the Cognitive Learning Domain

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In 1948, Benjamin Bloom led a committee of educators in developing educational thinking objectives (Forehand, 2005). These objectives were completed in 1956 (Huitt, 2004) and are now known as “Bloom’s Taxonomy,” comprising three learning dimensions: Cognitive, Affective, and Psychomotor (Atherton, 2005), each having progressive levels of attainment. While most accredit Bloom with all three domains, Huitt accredited Bloom with the Cognitive but claimed the affective and psychomotor domains were developed by others (p. 1). Atherton, however, accredited Bloom with all three, but regarding the psychomotor stated:

Bloom never completed work on this domain, and there have been several attempts to complete it. One of the simplest versions has been suggested by Dave (1975): it fits with the model of developing skill put forward by Reynolds (1965), and it also draws attention to the fundamental role of imitation in skill acquisition. (p. 3)

Bloom’s work is viewed as seminal in promoting critical thinking among students. Wakefield (1998) stated: “Critical thinking theory finds its roots primarily in the works of Benjamin Bloom as he classified learning behaviours in the cognitive domain” (p. 1). The levels, especially in the cognitive domain, demonstrate the level of thinking skills employed by the student and should be fostered by the educator through assessment questions, encouraging the student from simply dwelling in the lower levels of thinking to the higher levels of thinking skills. Although Bloom’s work has remained an educational assessment staple for more than fifty years, there have been revisions to the taxonomy (Forehand, 2005), and according to Dettmer (2006), “It is time to review the original version for ways it might be made more relevant and powerful for present day teaching and learning” (p. 3). In an appraisal of the three leaning domains proffered by Bloom, Dettmer suggested ways to restructure the existing domains, including renaming psychomotor to “sensorimotor” (“Altering Psychomotor Taxonomies”

section, p. 7), as well as adding a Social Domain as the fourth learning domain. In this new learning domain, “relate, communicate, participate, negotiate, adjudicate, collaborate, initiate, and convert” (“Altering Psychomotor Taxonomies” section, p. 7) describe the progressive phases.

The Cognitive Learning domain, which refers to “knowledge structure” (Atherton, 2005, p. 5), has six levels. Beginning with the lowest, the levels of progression are: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation (et al.). This domain has undergone revisions as Forehand (2005) explained:

During the 1990's, a former student of Bloom's, Lorin Anderson, led a new assembly which met for the purpose of updating the taxonomy, hoping to add relevance for 21st century students and teachers. This time "representatives of three groups [were present]: cognitive psychologists, curriculum theorists and instructional researchers, and testing and assessment specialists" (Anderson, & Krathwohl, 2001, p. xxviii). Like the original group, they were also arduous and diligent in their pursuit of learning, spending six years to finalize their work. Published in 2001, the revision includes several seemingly minor yet actually quite significant changes. Several excellent sources are available which detail the revisions and reasons for the changes. A more concise summary appears here. The changes occur in three broad categories: terminology, structure, and emphasis. (p. 10)

Forehand identified the cognitive terminology revisions as: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating. Further noting the terminology changes, Forehand pointed out that Bloom’s original noun descriptions of the cognitive domain were changed to verbs under the revision.

Successful application of the cognitive domain is accomplished through assessment questions and uses certain words to facilitate higher thinking skills. Wakefield (1998) gave specific words associated with each level of the cognitive domain. Depending on the level in which the teacher wants the student to perform, questions are asked using words to generate thinking skills on that particular level. The following are sample questions a teacher might use to

initiate desired levels of thinking on a student's part. Since the taxonomy is a basic template of suggested words, and therefore adaptable, the sample questions here will use the word "widget" as the object of thought.

The Knowledge level is the lowest of the thinking skills levels. Sample questions might be; (a) List ways in which you use widgets; (b) Give the definition of a widget; and (c) Name the standard parts of a widget. Each of these questions requires only basic knowledge of the subject and requires little thinking skills.

The comprehension level is still considered to be in the lower thinking skills. Sample questions might be; (a) Based on what you know about widgets, how can a widget be misused? (b) Demonstrate proper installation of a widget; and (c) Summarize the importance of proper widget use.

The application level is mid-range, in the taxonomy, but still considered lower level thinking skills. Sample questions might be; (a) Of the various types of widgets, choose the best for your application; (b) Produce a diagram showing how a widget is constructed; and (c) Compose a scenario where widgets might need to be changed in the future.

The Analyzing level demonstrates critical thinking skills. Sample questions might be (a) Analyze the new and the old widgets, showing how and why the newer out performs the older; (b) Take apart a new widget and an old widget, examine the parts and explain how they differ; and (c) Contrast the production of the new widget with that of the old widget.

The Synthesis level is higher level thinking as demonstrates ways to combine former ways of thinking or doing in order to make new. Sample question might be; (a) Combine the best functions of the old and new widgets to make an even better widget; (b) Imagine new ways people might need to use widgets in the near future; and (c) Forecast ways in which the widget

will need to be changed with time.

The Evaluation level demonstrates higher thinking skills as they relate to importance, or decision making. Sample questions might be; (a) Evaluate the recent additions to the widget, giving the pros and cons; (b) What added value do you find in the recent widget modifications? and (c) In view of productivity, critique the performance of the new widget.

As stated previously, Wakefield (1998) attributed the primary roots of critical thinking to Bloom's work. So evaluating the learning domains necessitates some attention to critical thinking and how it applies to education. Bers (2005) lamented that while postsecondary education normally accepts critical thinking as axiomatic to the educational process, few dedicated critical thinking courses are offered. He contended that the fact that critical thinking has varied definitions is due to inconsistent postsecondary treatment of critical thinking. Paul (2005) would concur with Bers' assessment of poor critical thinking facilitation in colleges. He, too, reported higher education's poor performance in critical thinking, and proffered three facts:

[a] most college faculty at all levels lack a substantive concept of critical thinking; [b] most faculty don't realize they lack a substantive concept and instead believe they understand critical thinking sufficiently and are already successfully teaching it within their discipline; [c] despite "reform" efforts, lecture, rote memorization, and (largely ineffective) short-term study strategies are still the norm in college instruction and learning today. (p. 1)

Paul contended that faculty contentment in their critical thinking understanding is part of the problem. He accused faculty of being the root cause of poor critical thinking and supported his indictment of faculty with this observation: "A critical thinker does not say: 'My thinking is pretty good on the whole. I don't really need to think much about it; I just need to use it intuitively'" ("Foundations for a Substantive Concept of Critical Thinking" section, p. 2).

Counter wise, he offered what ought to be a critical thinker's attitude:

My thinking, and that of most people, is flawed. The flaws that exist commonly in thinking frequently lead to significant problems in human life. It is foolish ever to take thinking for granted. If we want to think well, we must regularly analyze, assess, and reconstruct it. (“Foundations for a Substantive Concept of Critical Thinking” section, p. 2)

If Paul and Bers are correct, traditional education must undergo painstaking changes to adhere to Bloom’s Taxonomy.

Practical application of Bloom’s cognitive domain is deemed applicable not only in formal educational settings, but also in educating workers in the industrial realm. For example, Roberge has a Web site called *Corrosion Doctors* (Roberge, 2006). In this Web site, Roberge has adapted Bloom’s Taxonomy, making it applicable to training those working and preventing corrosion. He listed each of the six levels of the cognitive domain and illustrates each level of thinking with explanations and appropriate level questions dealing with corrosion.

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