

Research for Mentoring Minds' Critical Thinking Wheel

Bloom (Bloom, Englehart, Furst, Hill, and Krathwohl, 1956) developed a classification of levels of intellectual behavior in learning. This taxonomy contained three domains: the cognitive, psychomotor, and affective. Within the cognitive domain, Bloom identified six levels: knowledge, comprehension, application, analysis, synthesis, and evaluation. This domain and all levels are still useful today in developing the critical thinking skills of students.

The *Critical Thinking Wheel* provides educators quick and easy access to critical thinking based on Bloom's Taxonomy. The wheel contains information that helps teachers build effective lessons for all subjects and all grade levels. For each level of Bloom's, the wheel offers a definition, Power Words for constructing quality lessons, questioning prompts to stimulate thinking, and teaching suggestions for teachers to promote student involvement.

Critical thinking is cited as an important issue in education today. Attention is focused on good thinking as an important element of life success (Huitt, 1998; Thomas and Smoot, 1994). "Perhaps most importantly in today's information age, thinking skills are viewed as crucial for educated persons to cope with a rapidly changing world. Many educators believe that specific knowledge will not be as important to tomorrow's workers and citizens as the ability to learn and make sense of new information" (Gough, 1991).

The ability to engage in careful, reflective thought is viewed in education as paramount. Teaching students to become skilled thinkers is a goal of education. Students must be able to acquire and process information since the world is changing so quickly. Some studies purport that students exhibit an insufficient level of skill in critical or creative thinking. In his review of research on critical thinking, Norris (1985) surmised that students' critical thinking abilities are not widespread. Most students do not score well on tests that measure ability to recognize assumptions, evaluate controversy, and scrutinize inferences.

Thus, students' performances on measures of higher-order thinking ability reveal a critical need for students to develop the skills and attitudes of effective thinking. Furthermore, another reason that supports the need for thinking skills instruction is the fact that educators appear to be in general agreement that it is possible to increase students' creative and critical thinking capacities through instruction and practice. Presseisen (1986) asserts that the basic premise is students can learn to think better if schools teach them how to think. Adu-Febiri (2002) agrees that thinking can be learned. According to Sousa (2006), students are not actually taught to think because children are born with the brain organizational structure that originates thinking. As educators, students can be assisted in organizing the content of their thinking to facilitate complex reasoning. Sousa supports Bloom's

Taxonomy as an organizational structure that is compatible with the manner in which the brain processes information to promote comprehension.

Research indicates that thinking skills instruction makes a positive difference in the achievement levels of students. Studies that reflect achievement over time show that learning gains can be accelerated. These results indicate that the teaching of thinking skills can enhance the academic achievement of participating students (Bass and Perkins, 1984; Bransford, 1986; Freseman, 1990; Kagan, 1988; Matthews, 1989; Nickerson, 1984). Critical thinking is a complex activity and we should not expect that one method of instruction will prove sufficient for developing each of its component parts. Carr (1990) acknowledges that we have learned that while it is possible to teach critical thinking and its components as separate skills, they are developed and used best when learned in connection with content knowledge. To develop competency in critical thinking, students must use these skills across the disciplines or the skills could simply decline and disappear. Teachers should expect students to use these skills in every class and evaluate their skills accordingly. Hummel and Huitt (1994) stated, "What you measure is what you get."

Students are not likely to develop these complex skills or to improve their critical thinking abilities if educators fail to establish definite expectations and measure those expectations with some type of assessment. Assessments (e.g., tests, demonstrations, exercises, panel discussions) that target higher-level thinking skills could more than likely lead teachers to teach content at those levels, and students, according to Redfield and Rousseau (1981), to perform at those levels. Students not only need to know an enormous amount of facts, concepts, and principles, they also must be able to effectively think about this knowledge in a variety of increasingly, complex ways. If test items are used that only require lower-level thinking skills such as knowledge and comprehension, students will not develop and use their higher-order skills even if instructional methods that employ these skills are implemented. Individuals do not do what is expected, only what is inspected.

Solving problems in the real world and making worthwhile decisions is valued in our rapidly changing environment today. Paul (1985) points out that "thinking is not driven by answers but by questions." The driving forces in the thinking process are the questions. When a student needs to think through an idea or issue or to rethink anything, questions must be asked to stimulate thought. When answers are given, sometimes thinking stops completely. When an answer generates another question then thought continues. Paul ascertains that students who ask quality questions are really thinking and learning.

Teachers need to ask questions of students to turn on their intellectual thinking engines. The questions should be asked purposefully to require students to use the thinking skills which the teacher is trying to develop. Students can generate questions from teachers' questions to get their thinking to move forward. Thinking

is of no use unless it goes somewhere, and again, the questions we ask determine where our thinking goes. The *Critical Thinking Wheel* offers questioning stems for teachers as well as students so that either the student or the teacher can generate questions to make meaning from content. There are some questions, at the lower level, that imply the desire not to think but merely to recall information from memory. Questions at higher levels must be asked to drive students' thinking to a deeper level and lead them to deal with complexity, rather than just search through text to find an answer.

Questions can lead to understanding. Many students typically have no questions. They might sit in silence with their minds inactive as well. Sometimes the questions students have tend to be shallow and nebulous which might demonstrate there are times they are not thinking through the content they are expected to be learning. If we, as educators, want students to think we must stimulate and cultivate thinking with questions. The *Critical Thinking Wheel* provides the questioning prompts that teachers need.

Teachers need to plan for the type of cognitive processing they wish to foster and then design learning environments and experiences accordingly. Sometimes it is necessary to lecture. Other times, the teacher balances methods of instruction by providing opportunities for the students to take some ownership of their learning. Various learning styles need to be addressed. Studies suggest that the classroom environment can be arranged to be conducive to high-level thinking. The findings include the following: an environment free from threats, multi-level materials, acceptance of diversity, flexible grouping, the teacher as a co-learner, and a nurturing atmosphere. A climate which promotes psychological safety and one in which students respect each other and their ideas appears to be the most beneficial (Klenz, 1987; Marzano, Brandt, Hughes, Jones, Presseisen, Rankin, and Suhor, 1988). Teachers make a series of adjustments daily to promote learning. Classrooms free of harassment lead to positive behaviors which are a pre-requisite for success and growth in learning.

“Multiple forms of student engagement exist when high-level thinking is fostered. Examples of engagement include: collaborative group activities, problem-solving experiences, open-ended questions that encourage divergent thinking, activities that promote the multiple intelligences and recognize learning styles, and activities in which both genders participate freely. Brain researchers suggest that teachers use a variety of higher-order questions in a supportive environment to strengthen the brain” (Cardellichio and Field, 1997). “Meaningful learning requires teachers change their role from sage to guide, from giver to collaborator, from instructor to instigator” (Ó Murchú, 2003). “Since students learn from thinking about what they are doing, the teacher’s role becomes one of stimulating and supporting activities that engage learners in critical thinking” (Bhattacharya, 2002).

All teachers can develop questions at various times that span the levels of Bloom's Taxonomy. The difficult part is to address each level in the same lesson, although it is not necessary to do this in every lesson. The main point is that teachers help students advance beyond simple repetition to self-regulated learning. Students are not empty vessels waiting to be filled with information. Students must take an active role in which they locate, organize, synthesize, evaluate, and present information, transforming it into knowledge in the process. Students can work collaboratively with classmates to explore a problem. This makes it possible for each student to come to his or her own understanding of a particular topic as he or she constructs knowledge. This type of environment is focused on the learning and is more student-centered than the traditional classroom.

If the classroom becomes more student-centered, then what does this mean for the teacher? Is he or she no longer necessary? The role of the teacher is just as important as it has always been, perhaps more so. With an understanding of learning styles and of Bloom's Taxonomy, the teacher works along with the students to develop critical thinking. Teachers scaffold learning so that students can assume a more active role in their own learning. This means that lessons are in fact more carefully constructed to guide students through the exploration of content using Bloom's Taxonomy. Once again, the *Critical Thinking Wheel* is an effective resource for the classroom teacher in the selection of questions to pose to students.

"Recognizing that there are different levels of thinking behaviors important to learning, Benjamin Bloom and his colleagues developed Bloom's Taxonomy, a common structure for categorizing test questions and designing instruction. The taxonomy is divided into six levels, from basic factual recall, or Knowledge, to the highest order, Evaluation, which assesses value or asks the teacher or learner to make judgments among ideas. In the 1950s, Bloom found that 95% of the test questions developed to assess student learning required them only to think at the lowest level of learning, the recall of information. Now, a considerable amount of attention is given to students' abilities to think critically about what they do" (Hobgood, Thibault, and Walbert, 2005). Leaders in various businesses, medical fields, and other professions have voiced their concern that schools are not preparing students to be critical thinkers. Having knowledge of the procedure for CPR, how to estimate expenses, or being able to calculate elapsed time is no longer enough. These skills have little value without the ability to know how, when, and where to apply them. Thus, teachers must consistently utilize the array of questions to students at the analysis, synthesis, and evaluation levels as noted on the *Critical Thinking Wheel*.

The No Child Left Behind Act of 2001 emphasizes the need for evidence-based materials. The Mentoring Minds Product Development team sought to develop a tool that teachers could use to develop students who value knowledge and learning. The development of the *Critical Thinking Wheel* incorporates

researched-based strategies and sound principles of teaching and learning. The pursuit of a product that leads students to think for themselves, that assists students and teachers in knowing how to question, that helps students recognize when additional information is needed, that enables students and teachers to ask critical questions when more information is needed, and that leads students to know how to evaluate ideas, products, or situations to determine the effectiveness resulted in the *Critical Thinking Wheel*.

Mentoring Minds' *Critical Thinking Wheel* is based on the six levels of Bloom's Taxonomy. Studies over the last 40 years have confirmed Bloom's Taxonomy of the Cognitive Domain as a framework to establish intellectual and educational outcomes. The conclusions reached by researchers substantiate that students achieve more when they manipulate topics at the higher levels of Bloom's Taxonomy. Our goal at Mentoring Minds is to support educators in their endeavors to help students move up the critical thinking ladder to higher levels of thought.

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