# Research for Mentoring Minds' Power Strips Plus

Bloom (Bloom, Englehart, Furst, Hill & 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. Teaching critical thinking skills is one of the greatest challenges facing teachers in the classroom today. The most widely used model for the development of higher level thinking skills is Bloom's Taxonomy.

Students must be guided to become producers of knowledge. An essential instructional task of the teacher is to design activities or to create an environment that allows students opportunities to engage in higher-order thinking (Queensland Department of Education, 2002). With *Power Strips Plus,* the teacher can incorporate all levels of the taxonomy to plan questions and learning activities in every subject area. "Power Strips" allow a teacher to individualize learning according to the interests, abilities, and specific learning needs present in the differentiated classroom, from special needs students to students in gifted education. There are a number of independent or collaborative activities where students can become active participants when using the strips.

*Power Strips Plus* also supports the multiple intelligences or the differing learning styles within a classroom. Students learn and excel when provided multiple, varied opportunities. A classroom that offers an array of learning experiences increases the likelihood of success for more students (Gardner, 1983; Dunn and Dunn, 1978). Studies involving multi-sensory teaching experiences show students achieve more gains in learning than when taught with a single approach, whether it is a visual or an auditory approach (Farkas, 2003; Maal, 2004). Multi-sensory instruction or a combination of approaches appears to create the optimal learning setting, even for students with disabilities (Clark and Uhry, 1995). The variety in formats, within the different leveled "Power Strips," has the potential to improve student interest, increase student interaction, and extend classroom learning. This educational tool contributes to the creation of a powerful learning environment by allowing students to be active participants and take more responsibility in their own learning.

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 incorporating thinking skills activities 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 the basic premise is that students can learn to think better if schools teach them how to think. Adu-Febiri (2002) agrees that thinking can be learned.

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 one method of instruction to prove sufficient for developing each of its component parts. Carr (1990) acknowledges 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 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 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. *Power Strips Plus* suggests experiences that engage the learner with multiple activities at each level of thinking. The strips can be used as part of the daily instruction as students explore content and gather

knowledge; they can be used as periodic checkpoints for understanding; they can be used as a practice review; or they could be used as an ongoing assessment tool as teachers gather formative and summative data.

Teachers play a key role in promoting critical thinking among students using "Power Strips" as a communication tool. Four forms of communication are affected in critical thinking: speaking, listening, reading, and writing. *Power Strips Plus* contains a wide range of learning tasks that engage students to think critically and contribute to their intellectual growth. This educational resource relates to any content that is presented to students and saves teachers activity preparation time. A teacher must examine what he/she fully intends to achieve from the lesson and then select the appropriate critical thinking activity strip to complement the instructional purpose or the cognitive level of thinking. The level of the "Power Strips" used influences the depth of thinking that occurs.

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.

Teachers need to ask questions and design learning experiences to turn on students' intellectual thinking engines. 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 asked or the activities selected to engage students in learning determine the direction of their thinking. While students are working on the activity generated by the chosen power strip, the teacher could ask questions to draw meaning from the content being undertaken. The "Power Strips" which reflect the higher orders of thought (analysis, synthesis, and evaluation) drive students' thinking to a deeper level and lead students 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 that 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 (Paul, 1990). By engaging students in a variety of questioning that relates to the idea or content being studied, students develop and apply critical thinking skills. Consequently, by using the analysis, synthesis, and evaluation levels of *Power Strips Plus*, students are challenged to work at tasks that are more demanding, thought-provoking, and make connections with real life.

Teachers need to plan for the type of cognitive processing they wish to foster and then design learning environments and experiences accordingly. 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). 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. Lovelace (2005) concluded that matching a student's learning style with the instruction can improve academic achievement and student attitudes toward learning. Various learning styles or activities that focus on the strengths of how students best learn need to be addressed in the classroom. *Power Strips Plus* offers tasks that represent those various modes of learning. The range of activities or tasks run the gamut from creative opportunities (writing a poem, composing a song, designing an advertisement, constructing a model) to participating in a panel discussion, presenting a speech, conducting a survey, holding an interview, using a graphic organizer, or simply compiling a list.

"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 teachers use a variety of higher-order questions in a supportive environment to strengthen the brain" (Cardellichio and Field, 1997). "Meaningful learning requires teachers to 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 who stimulates and supports activities that engage learners in critical thinking" (Bhattacharya, 2002).

All teachers can develop questions and learning activities 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. With *Power Strips Plus*, students take an active role in learning as they locate, organize, synthesize, evaluate, and present information, transforming it into knowledge in the process. Students can work independently or 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 with the students. Teachers scaffold learning so that students can assume a more participatory 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 via *Power Strips Plus*. Attention to Bloom's Taxonomy does not mean that every class period must be optimally designed to place students in inquiry-based roles. Teaching requires that we constantly assess where students are and how best to address their needs.

"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 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" (Hobgood, Thibault and Walbert, 2005). Today, a considerable amount of attention is given to students' abilities to think critically about what they do. 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. Utilizing *Power Strips Plus,* as one avenue for students to work through the various levels of Bloom's Taxonomy, strengthens the abilities of students to think at higher levels.

By incorporating *Power Strips Plus* into instruction, the teacher can structure learning experiences in a variety of ways:

- All students work through the Knowledge and Comprehension levels, then choose or assign one or more activities from any of the other levels
- Some students work through the Knowledge and Comprehension levels while others work at higher levels
- Select some activity strips that are mandatory while others are optional
- Invite students to design their own activities using ideas from *Power Strips Plus*

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 *Power Strips Plus* incorporates researched-based strategies and sound principles of teaching and learning. There are 18 open-

ended strips color-coded to each level of Bloom's Taxonomy for a total of 108 strips. The colors of the "Power Strips" represent a variety of questions or tasks of different levels of difficulty so that all students may choose or be allocated work at which they are likely to succeed. Hundreds of critical thinking suggestions are given for the content areas of Math, Reading, Science, and Social Studies. This product can be utilized as a daily warm-up, as part of a small group or whole group discussion, for independent assessment of instruction, as a student choice activity, as a response to the lesson, or in other instructional settings.

Mentoring Minds' *Power Strips Plus* 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 the fact 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 as they apply critical thinking skills to their studies.

## Bibliography for Power Strips Plus


Adu-Febiri, F. (2002). Thinking skills in education: ideal and real academic cultures. *CDTL Brief*, 5, Singapore: National University of Singapore.

Bass, G., Jr. & Perkins, H. (1984). Teaching critical thinking skills with CAI. *Electronic Learning*,14, 32, 34, 96.

Bhattacharya, M. (2002). Creating a meaningful learning environment using ICT. *CDTL Brief*, 5, Singapore: National University of Singapore. Retrieved March 2007, from http://www.cdtl.nus.edu.sg/brief/v5n3/sec3.htm

Bloom, B., Englehart, M., Furst, E., Hill, W., & Krathwohl, D. (1956). *Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive Domain*. New York: Longmans Green.

Bransford, J.D., Burns, M., Delclos, V. & Vye, N. (1986) Teaching thinking: evaluating evaluations and broadening the data base. *Educational Leadership*,44, 68-70.

Carr, K. (1990). How can we teach critical thinking? *ERIC Digest*. ERIC NO.: ED326304.

Cardellichio, T. & Field, W.(1997). Seven strategies to enhance neural branching. *Educational Leadership,* 54, (6).

Clark, D., & Uhry, J. (1995). *Dyslexia: Theory and Practice of Remedial Instruction* (2nd Ed.). Baltimore: York.

Dunn, R. & Dunn, K. (1978). *Teaching students through their individual learning styles: A practical approach*. Englewood Cliffs, NJ: Prentice Hall.

Education Queensland. (2002). What is higher-order thinking? *A guide to Productive Pedagogies: Classroom reflection manual*. Queensland: Department of Education.

Farkas, R.D. (2003). "Effects of traditional versus learning-styles instructional methods on middle school students. *Journal of Educational Research*, 97, 43-81.

Freseman, R. (1990). *Improving Higher Order Thinking of Middle School Geography Students By Teaching Skills Directly*. Fort Lauderdale, FL: Nova University.

Gardner, H. (1983). *Frames of Mind: The Theory of Multiple Intelligences*. New York: NY, BasicBooks.

Gough, D. (1991). *Thinking about Thinking*. Alexandria, VA: National Association of Elementary School Principals.

Hobgood, B., Thibault, M., & Walbert, D. (2005). *Kinetic connections: bloom's taxonomy in action*. University of North Carolina at Chapel Hill: Learn NC.

Huitt, W. (1998). Critical thinking: An overview. *Educational Psychology Interactive*. Valdosta, GA: Valdosta State University. Retrieved May 5, 2007 from, http://chiron.valdosta.edu/whuitt/col/cogsys/critthnk.html. [Revision of paper presented at the Critical Thinking Conference sponsored by Gordon College, Barnesville, GA, March, 1993.]

Hummel, J., & Huitt, W. (1994). What you measure is what you get. *GaASCD Newsletter: The Reporter*, 10-11.

Kagan, D.(1988). Evaluating a language arts program designed to teach higher level thinking skills. *Reading Improvement* (25), 29-33.

Klenz, S. (1987). Creative and Critical Thinking, *Saskatchewan Education Understanding the Common Essential Learnings*, Regina, SK: Saskatchewan Education.

Lovelace, M.(2005). Meta-analysis of experimental research based on the Dunn and Dunn model. *Journal of Educational Research*, 98: 176-183.

Maal, N. (2004). Learning via multisensory engagement. *Association Management*. Washington, D.C.: American Society of Association Executives.

Marzano, R., Brandt, R., Hughes, C., Jones, B., Presseisen, B., Rankin, S. & Suhor, C. (1988). *Dimensions of Thinking: A Framework for Curriculum and Instruction.* Alexandria, VA: Association for Supervision and Curriculum Development.

Matthews, D. (1989).The effect of a thinking-skills program on the cognitive abilities of middle school students. *Clearing House*,62, 202-204.

Nickerson, R. (1984). *Research on the Training of Higher Cognitive Learning and Thinking Skills*. Final Report # 5560. Cambridge, MA: Bolt, Beranek and Newman, Inc.

Norris, S.P. (1985). Synthesis of research on critical thinking. *Educational Leadership,* 42, 40-45.

Ó Murchú, D. (2003). *Mentoring, Technology and the 21st Century's New Perspectives, Challenges and Possibilities for Educators*. Second Global Conference, Virtual Learning & Higher Education, Oxford, UK.

Paul, R.W.(1985). Bloom's taxonomy and critical thinking instruction. *Educational Leadership,* 42, 36-39.

Paul, R. (1990). *Critical Thinking: What Every Person Needs to Survive in a Rapidly Changing World*. Rohnert Park, CA: Center for Critical Thinking and Moral Critique.

Presseisen, B.Z. (1986). *Critical Thinking and Thinking Skills: State of the Art Definitions and Practice in Public Schools*. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA.

Redfield, D. L., & Rousseau, E. W. (1981). A meta-analysis of experimental research on teacher questioning behavior. *Review of Educational Research*, 51, 181-193.

Tama, C. (1989). Critical thinking has a place in every classroom. *Journal of Reading,* 33, 64-65.

Thomas, G., & Smoot, G. (1994, February/March). Critical thinking: A vital work skill. *Trust for Educational Leadership,* 23, 34-38.