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The teaching of "critical thinking" and "higher order skills"—buzz words in education today—is in danger of becoming another educational fad, here today and gone tomorrow.

That students are lagging in problem-solving and thinking is apparent at all levels of education. The irony is that the tendency of many educators to look for a "quick fix" foreshadows the eventual end of the movement. The "layering on" of separate courses in thinking and the use of workbook-type materials are easy answers—too easy. They threaten to fragment thinking skills, while failing to build responsible attitudes toward problem-solving. Rather, teachers in all disciplines must teach their students to question, to analyze and to look beyond the superficial for all possible answers.

The need to teach higher order thinking skills is not of recent origin; education pundits have been calling for renewed interest in problem-solving for a number of years. Eight years ago the Association for Supervision and Curriculum Development, citing drops in NAEP scores for 17-year-olds from 1973 to 1978, warned members in a newsletter: "Problem-solving, higher order cognitive skills, intelligence—whatever it's called, thinking is in big trouble in the American classroom" (Brandt, 1980). As far back as 1967 Raths, Jonas, Rothstein and Wassermann (1967) decried the lack of emphasis on thinking in the schools. They noted that " . . . memorization, drill, homework, the three Rs [and the] quiet classroom" were rewarded, while "... inquiry, reflection [and] the consideration of alternatives [were] frowned upon."

Current efforts to teach thinking, however, may be more superficial than substantive, posing hidden dangers. Critical thinking courses and texts, in particular, may result in fragmentation of thinking skills. Thinking cannot be divorced from content; in fact, thinking is a way of learning content (Raths et al., 1967). Students should be taught to think logically, to analyze and compare, to question and evaluate in every course, especially content subjects. Skills taught in isolation do little more than prepare students for tests of isolated skills (Spache & Spache, 1986). The same criticism may be made with regard to commercial "thinking skills" materials; when integrated with content, however, they may become effective tools for attacking "real" issues.

Moreover, critical thinking courses may provide students with the techniques of problem-solving and critical analysis, while failing to develop the desire and commitment to seek reasons and judge impartially (Benderson, 1984). Raths et al. (1967) alluded to this affective component when stating, "A population that cannot or will not think about its problems will not long remain free and independent."

Additionally, something tacked on to the curriculum is usually transitory in nature, a fad that is first to be cut in times of financial exigency or education reform.

"It really boils down to whether teachers are creating an environment that stimulates critical inquiry."

Photo courtesy of author

Definitions and Implications for Teaching

So what is to be done? At every level—elementary, secondary and college—thinking must be applied and practiced within each content field. This means harder work for the teacher. It's much easier to teach students to memorize facts and then assess them with multiple-choice tests. Course objectives must include application and analysis, divergent thinking, opportunities to organize ideas and support value judgments. When more teachers recognize that the facts they teach today will be replaced by the discoveries of tomorrow, the content-versus-process controversy may be resolved (Gallagher, 1975). As McMillen (1986) noted, "It really boils down to whether teachers are creating an environment that stimulates critical inquiry."

The following is a review of various types of thinking skills activities applied to content areas. While different disciplines frequently require different types of thinking relative to content, some techniques are effective across disciplines.

Critical Reading

Teaching students to think while reading—critical reading—should be central to any discussion of thinking skills, in part because the reading of textbooks plays such a prominent role in the content fields. Critical reading has been defined as learning to evaluate, draw inferences and arrive at conclusions based on the evidence (Zintz & Maggart, 1984).

News Media: Two of the many activities that promote critical reading will be described. One is the use of news media in the classroom—hardly a new idea, but one for which there is ample justification. Newspapers, magazines, television and radio can be motivating resources for developing critical listening and reading skills. For example, differing accounts and editorials can be compared to help students read with a questioning attitude. Students can then construct their own convincing arguments for discussion or publication in student newspapers. In the

FIGURE 1
True, False or Opinion Game

Directions: Make cards with statements that may be categorized as to "True," "False" or "Opinion." The cards can be self-checking with answers on the back, or they can be discussion starters without answers.

Chocolate ice cream is better than vanilla.
Birds have feathers.
Fishing is best at night.
Teachers never make mistakes.
Airplanes are safer than cars.
Soccer is played with a ball.
Football is the roughest sport.
Abraham Lincoln was the best President.
A ring around the moon means rain tomorrow.
Adults always tell the truth.

process, students become more discriminating consumers of news media, advertising and entertainment. Figure 1 shows a "fact or opinion game" that may be used in conjunction with critical reading of the newspaper.

Children's Literature: Children's literature—fiction, nonfiction, biography and poetry—is another powerful tool for teaching thinking. It, too, deals with problems of the human condition. Somers and Worthington (1979) noted that "... literature offers children more opportunities than any other area of the curriculum to consider ideas, values and ethical questions." Furthermore, literature that inspires and challenges helps students learn how to "engage" and interact with a book. When citing critical thinking weaknesses among college students, Jonathon Adler of Brooklyn College urged, "We must help students learn to read deeply" (McMillen, 1986).

Bloom's Taxonomy of the Cognitive Domain (1956) provides a useful structure to help the teacher devise higher order cognitive activities and discussion questions for children's literature. An example is found in Figure 2.

Writing To Learn

In keeping with the current emphasis on "writing across the curriculum," composition/rhetoric scholars stress teaching thinking through writing. Elbow (1983) presented a two-step writing process that he termed "first-order thinking" and "second-order thinking." For first-order thinking he recommended freewriting—an unplanned, free-association type of heuristic writing designed to help students discover what they think about a topic. The freewrite technique produces conceptual insights, Elbow pointed out. Instead of directing students to "think carefully" when responding to a difficult question, thus requiring them to "think about thinking" as well as the topic, Elbow asked students to write a few incidents that came to mind without careful thinking. This resulted in more intuitive, creative thinking. Elbow also cautioned that the reflective scrutiny of second-order thinking is a necessary follow-up of the freewrite. In this stage the writer examines inferences and prejudices and strives for logic and control.

Classification Games

Classification plays a significant role in the development of logical thinking and abstract concepts, from early childhood to adulthood. Classification skill is integral to vocabulary-concept development and, therefore, to reading and retention of information (Gerhard, 1975). For example, young children group concrete objects or pictures to form abstract concepts such as "vegetables," "vehicles" or "wild animals" (Gerhard, 1975).

All classification tasks require the identification of attributes and sorting into categories according to some rule (Furth & Wachs, 1974). While the sorting of concrete objects is an appropriate activity for the young child, verbal analogies (e.g., "How are a diamond and an egg alike?") are appropriate for any age learner. A number of commercial materials contain verbal analogies, logic puzzles, figural and symbolic problem-solving, and attribute games. Application to a wide variety of environmental objects must follow, however (Furth & Wachs). Integration of classification activities into content areas is key to their value. Applications to mathematics and science, especially the inquiry approach to science, are readily apparent. Figure 3 shows a classification game.

What may not be obvious are the applications of classification to reading in the content fields (e.g., social studies) and the retention of information read. Schema theory holds that information, if it is to be retained, must be categorized with something already stored in memory (Tonjes & Zintz, 1987). Brainstorming techniques that aid comprehension are recommended to help students access their prior

FIGURE 2
Directions for Literature Critical Thinking Activities

Based on Bloom's Taxonomy of the Cognitive Domain. Examples from *Dear Mr. Henshaw* by Beverly Cleary.

Plan two or more activities at each level. Students may choose one activity from each level.

Knowledge and Comprehension
Ask for facts and inferences that are important to understanding the story or help the student reconstruct the story in memory. Ask students to explain, describe, list reasons. Example:
1. What changes occurred in Leigh's home life during 6th grade?
2. How did Leigh solve the problem of the lunch-box thefts?
3. List three or more reasons why children write to authors.

Application
Apply skills or investigate related topics. Ask students to research, report, make a collection or scrapbook. Example:
4. Choose one of the following topics to investigate. List questions you would like to answer; select two sources of information; outline and report to the class.
   Cross-country Truck Driving
   Monarch Butterflies
   Careers in Nursing
   Careers in Writing

Analysis
Compare characters' motives and development; identify author's purpose, tone and mood. Ask students to examine, compare, contrast, infer. How did the author use humor? What do you think were . . . ? Example:
5. What do you think it means to be "grown-up?" List Leigh's father's good qualities. What grown-up qualities did he lack?

Synthesis
Combine ideas in a new way; develop a creative product. Suggest that students write a poem, paint, design, devise a plan, roleplay, write an epilogue. What would happen if . . . ? How could you improve . . . ? Example:
6. Choose a topic for creative writing; e.g., "A Day in the Life of (your name)," "Won't the Kids Be Impressed When . . ., " "My Ride with a Trucker."
7. Draw an original design of a scene of your choice; for example, "The Butterfly Trees" or "A Cab-over Rig."

Evaluation
8. Begin your own diary and try to remember to write every day. After a few weeks, see if it has made you feel better and improved your writing.
9. In your opinion, why did Leigh give Bandit back? What would you have done?
10. Which one of Beverly Cleary's books is your favorite? Why?

FIGURE 3
Classification Game
What's My Rule?

"What's My Rule?" is played with partners like a television game show.* The first player of Team 1 draws a card with a category; e.g., "Things that have wheels." Without showing the card, the player names as many examples in the category as possible until the partner guesses it. Then the turn passes to Team 2. A timekeeper records the number of seconds required to guess the category; the team with the shortest time wins.

Students enjoy making their own category cards, such as the following:

Things that are round	Reptiles
Things that have legs	Furniture
Things that have seeds	Musical Instruments
Things made of wood	Tools
Things that fly	Fruit
Things that are pairs	School Supplies
Things found at the beach	Picnic Supplies
Things that float	Nursery Rhymes
Things that are cold	Wild Animals

*Younger students can make Concept Books by cutting and pasting pictures in booklets by category.

knowledge about a topic to be read, and thus classify and retain the new information.

Devine (1986) pointed out that it may be necessary to restructure students' schemata when their prior experiences, having been limited to a different context, interfere with gaining a new concept. He used the example of students who were having difficulty seeing relationships between the concepts of social class and caste system. In a word association task, the students were asked to list everything they knew about each term separately. Then they were asked to find similarities; i.e., classify related facts and events, identify the common thread among those items and finally label them, thus forming new concepts or schemata.

Indeed, the urgent need to teach thinking skills at all levels of education continues, but we should not rely upon special courses and texts to do the job. Instead, every teacher should create an atmosphere where students are encouraged to read deeply, to question, to engage in divergent thinking, to look for relationships among ideas, and to grapple with real-life issues.

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