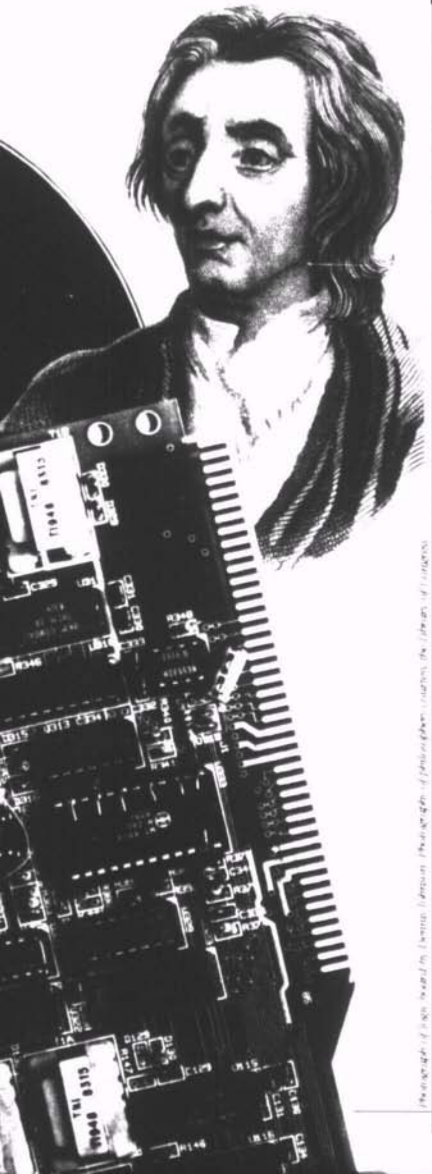
Let's Not Handicap Able Thinkers

JOHN BAER

Approaches to teaching thinking, if applied "thoughtlessly," may hinder students' thinking. It's the end result—good thinking—not the process that counts.



The renewed interest in how to teach students to be better thinkers is one of the most important directions that education has taken in recent years. In just a short time, the level of sophistication of educators' efforts to develop, implement, and evaluate programs that teach thinking has risen considerably.

But the nature of thinking has always puzzled humankind—thinking about thinking dates back at least to classical Greece—and wise educators will not ignore what has been learned about thinking outside the field of education. Epistemology has captured the interest of many of the world's best minds. In somewhat different guises, it still commands the attention of researchers and thinkers in fields as diverse as anthropology and artificial intelligence, linguistics, and neuroscience. Despite these efforts, we have yet to reach consensus on how we think, how our brains are organized, or how we acquire competence as thinkers.[1] Hasty assumptions by teachers and program developers may trip up both students who are learning how to think and the entire movement whose goal is to help them do so. And it may be the best student thinkers who pay the highest price for our misguided efforts.

Two important elements of the thinking skills movement are the direct teaching of thinking skills (Jackson 1986, Beyer 1984, Worsham and Stockton 1986) and approaches that emphasize self-reports of thinking processes[2] (Whimbey 1985, Beyer 1984, Costa 1985). Both are useful tools for promoting better thinking, and both should be pursued—but with caution. As will be shown, both approaches, when applied carelessly (or, perhaps, "thoughtlessly"), can backfire and inhibit thinking, especially with students who are already able thinkers. There is even a danger that the teaching of "thinking skills"—if it survives to become part of mainstream educational practice—may one day become to thinking what diagramming sentences and memorizing rules of grammar too often have become to writing.

The problem has to do with developing curriculums (in this case, to teach thinking skills) without understanding what it is we are teaching (which would require us to comprehend the nature of thought and how it develops—a formidable task indeed). We can't wait to teach thinking skills until we have solved the puzzles of epistemology, of course. But we can and should use what is known and—equally important—respect that which isn't.

Thought and Consciousness

A key unresolved issue in cognitive science (and, before that, in epistemology and psychology) that impinges upon the teaching of thinking is the relationship between thought and consciousness. Some educators, like David Perkins (Brandt 1986), believe that unconscious thinking, if it exists at all, is an unimportant aspect of critical and creative thinking. Others, like Benjamin Bloom (1986), suggest that unconscious thinking can result from internalizing once-conscious thought through practice, in this way making such well-rehearsed thinking automatic.[3] But there are also educators (Gordon 1961, Elbow 1983, Parnes 1972, Biondi 1972), as well as scores of philosophers, neuroscientists, linguists, anthropologists, and psychologists (Gardner 1985), who believe that a great deal, and possibly most, of important thinking is unconscious.[4] (See the sidebar "Is Thinking Unconscious?" for a quick look at this debate.)

Most of those who endeavor to teach thinking skills also assume that such skills can be improved through instruction—else why bother?—and to some degree this is certainly true. But the evidence that much thinking is defined not via cultural transmission but is instead built into the architecture of the brain is growing rapidly and cannot be dismissed lightly. (See the sidebar "Is Thinking Hard-Wired in Our Brains?" for a sampling of this evidence.) Even if, in the light of such findings, educators choose to make the most of the limited range of adaptability that may be allowed us, it is still

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worth recognizing and acknowledging the nature of the obstacles we hope to overcome.

Pieces of the Puzzle

My point here is not to prove that a large amount of thought is inaccessible to consciousness, nor to present a brief for nature-over-nurture in the development of thinking skills. The truth of the matter is we don't yet know that much about the nature of thinking. Both camps may possess important pieces of the puzzle, and neither side can be safely ignored. My fear is that, in devising thinking skills curriculums, we are inadvertently acting as if these issues were settled in favor of conscious, learned thought processes—and as a consequence, implementing programs that may harm students.

Accepting the possibility that thinking *may* occur both unconsciously and without learning not only humbles us; it also forces us to examine how we are teaching and testing thinking. Let me give an example. If a student who is quite skillful at making inferences from evidence happens to be in a class where this is taught as a systematic step-by-step procedure, she may be enjoined to follow the prescribed method of making inferences in class. If she is fortunate enough to have a teacher who stresses that the procedure being taught is but one of many effective ways to make inferences and who is willing to allow students who find other methods more workable to use those methods, no harm should be done. But if she is not so lucky, she might learn that this new way is the "right" way, and thereafter endeavor to follow the correct procedure, without heeding her unconscious inferences.

This is rather like being forced to type by deciding on the right letter, finding the matching key, pressing it, and checking to make sure it has been typed correctly. It works, but if you already know how to type, it makes the task far more cumbersome. Another analogy is what sometimes happens to skillful student writers who become so concerned about the rules of grammar that they become unable to write clear, fluent sentences. Some thinking, like some writing, happens faster and much better when it is simply allowed to happen (Elbow 1983).

Consider, for a moment, our impressions of how a microcomputer "thinks." It takes a program written in a language like BASIC, converts the first step into its "native" machine language (assembly), carries out that instruction at lightning speed, goes back to the program for the next step, changes that into machine language, carries out the instruction, goes back to the program. . . . It's a cumbersome process, but because of the speed at which the computer operates, you may feel that your BASIC program is, nonetheless, quite efficient.[5] Now imagine instead that you have a program written in machine language—the language many programmers use, especially in more complex, high-speed, interactive programs, such as videogames. Machine-language programs eliminate all the translating—they're written in the very language in which the computer "thinks"—and therefore cut the time to run the program considerably. Thus, a machine-language program is an even more powerful tool than its BASIC counterpart.

Unlike the "higher-level" language BASIC, computer machine languages bear no resemblance to the languages we speak, so you may find it hard to understand how they work—but that's no reason not to use and appreciate their ability to process information efficiently. Even a devoted BASIC programmer wouldn't tell you to throw away your efficient machine-language program and rewrite it in a slower higher-level language: such an act would be the height of folly. But that's just what we sometimes do to our most gifted thinkers—and often in the guise of teaching thinking skills.

A Place for Teaching Thinking

Does this mean we should abandon efforts to teach conscious thinking skills? Not at all. To continue the machine-language/programming-language metaphor, if there is no machine-language program, even a somewhat slower programming-language procedure is a huge advance. Similarly, if students are unable to do the kind of thinking we wish them to do, then it is appropriate for us to try to teach them ways to do it. And even if students demonstrate skillful thinking, that does not absolve teachers from helping them to improve and refine their abilities.[6] But it is essential that we assess student thinking before planning instruction in thinking and stress the importance of allowing alternative thinking styles, as long as they work.

There is, then, a place for instructing students in how to think; for even if we cannot reach to the actual "language" of thought (whatever and wherever it may be), we can perhaps influence thinking at a different level and in this way shape the processes that underlie these more superficial strata of cognition. But what of inductive and "think aloud" strategies that encourage students to reflect on their own thinking processes? Since these processes may in many cases be inaccessible to consciousness, can there be any value to such approaches? There is evidence that they have helped improve student thinking (Costa 1984, Sternberg and Bhana 1986), and it is possible that these approaches may also work by indirectly accessing the deeper structures of thinking. But it is important to remember that some students may be able to think quite well and yet be unable to describe "how" they think.[7] In this light, it would be unwise to devise tests that require students to report on their thinking processes and strategies as part of an evaluation of students' thinking skills. This testing would be a flagrant confusion of means and ends, both unfair and dangerous.

This is not to suggest that we must trust one another's intuitions, or, for that matter, our own. As Richard Paul (1986) points out, what comes to us as an intuition may in fact be a prejudice; only by examining such revelations critically can we hope to determine which are which. But there is a tremendous difference between critically examining an idea, on one hand, and stating the process used to generate the idea, on the other. Both are important, and there may well be some commonalities in procedure; but it appears that they are distinct and, at least in some cases, very different, mental activities. Asking students to defend their thinking is certainly proper, but to demand that thinkers be able to uncover and explain the process by which their thoughts developed is something else entirely.[8]

The Product, Not the Process

Here I have highlighted a problem in the teaching of thinking, one that emphasizes the need for sensitive and conscientious teachers of thinking: we must appreciate that good thinking is in no way less valuable for being produced in unconventional (or unconscious) ways. As an extreme case, most educators today would not insist that all thought follow the rules of the syllogism and deductive logic, even though this is a recognized tool for producing valid conclusions. We realize that much rational thinking does not occur in such orderly fashion. But we must be careful not to make the same mistake in a more modern guise. We must remember that the proof of good thinking is not in the process by which it is achieved. We would do well to keep in mind the mechanics' maxim: "If it ain't broke, don't fix it."

But many students' thinking is "broke" or at least far from satisfactory, and we must try to challenge and teach these students to think as best we can. Various programs and approaches have been proposed, and school districts nationwide are deciding which are most appropriate and practical. A consideration missing from too many of these discussions, however, is how to select or train teachers to implement whatever plan is devised. There has probably never been a "teacher-proof" curriculum[9] in anything, and certainly there cannot be in the teaching of thinking. For this reason, to mandate that all teachers shall participate in a thinking skills program may be courting disaster.

Is Thinking Unconscious?

Try this test: Imagine yourself standing in front of your closet, deciding what to wear to the theater. Now choose something to put on, and imagine how you'd look wearing it. Which would be better, that outfit or the one you are now wearing?

Could you do it? How did you do it? What directed your thinking process as you imagined yourself in a different place wearing different clothes, and as you then compared your appearance in that imagined scene with the one you have now? Were you aware of controlling your thoughts—of how you went about creating a mental picture, and of the procedures you used in making a judgment?

Countless philosophers and psychologists from the time of the Greeks have studied mental imagery, and it's one of the most hotly contested subjects in cognitive science today. And yet, despite this effort on the part of some of the West's finest minds, the experts in the field not only disagree on how we construct mental images; they even argue if "mind's eye" images exist at all (Gardner 1985).

A recent argument for nonconscious thought is that of split-brain experimenter Michael Gazzaniga (1985), who theorizes that our brains are organized into relatively independent functional modules that operate without our being aware of them. What we normally consider conscious thought, he argues, typically occurs after a decision has been reached, and often without access to the line of thinking that actually occurred. Split-brain patients (in whose brains all connections between left and right hemispheres have been severed) provide dramatic examples of this. With several (but not all) of these patients, instructions directed to the right hemisphere will be carried out competently, even many tasks that involve higher-order thinking skills of analysis, synthesis, and evaluation—but the conscious subject will not know why he is doing what he is doing.[1]

In one experiment the subject is directed, via a printed message flashed only to the right hemisphere of her brain, to leave the room. When asked why she is leaving, the subject will invariably give a plausible reason (going to the restroom, to get a drink, or to stretch her legs). The experimenter knows, of course, that this is an after-the-fact invention; but the subject, whose verbal, left-hemisphere consciousness is unaware of the instruction that has been flashed to her right hemisphere, believes that she is consciously directing her own behavior and that she has given a true account of what she is doing. Gazzaniga compares this to what we sometimes do when we rationalize our decisions and actions. Other experiments with split-brain patients demonstrate that comparing, judging, and matching related items can all occur without subjects knowing how they did it, or even what they had done—that is, without any conscious thought whatsoever (Springer and Deutsch 1985, Gazzaniga 1985).

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1. The brain's right hemisphere typically has some language-comprehension skills but lacks the ability to employ language expressively, although there is considerable controversy among researchers regarding the precise nature of the right hemisphere's language abilities (Springer and Deutsch 1985).

Is Thinking Hard-Wired in Our Brains?

Classification seems the ideal, eminently teachable thinking skill. It is interestingly open-ended—there are many reasonable ways to classify the same data, depending on the criteria used—and yet orderly, like a grid or an outline, with everything falling (when the job is done well) neatly into one category or another. It is also a highly transferable skill, important in both the arts and sciences, and can be used as the basis for teaching related skills, such as applying and developing criteria by which to make judgments. And until recently anthropologists assured us that the ways we categorized things were rigidly culture-bound, and thus learned, behavior. Psychologists concurred, showing that classification was highly dependent upon language.

But in the past decade and a half, a shift has occurred in anthropology and psychology (Gardner 1985). One "thinking skills" domain that psychologists and anthropologists had studied intensively was the classification of colors, with many studies purporting to show the effects of language on the ways in which people divide the color spectrum. In 1970, Eleanor Rosch (then Eleanor Heider) studied a Stone Age people in New Guinea, the Dani, who had but two color terms (one for warm, bright colors; the other for dark, cold ones). On naming tests, she found what others had found—the Dani named colors very differently from Americans. But on a test of recognition of colors, in which subjects were shown a color chip, then obliged to wait in the dark for 30 seconds, and finally asked to pick out an identical color from an array of 40 such chips, the Dani performed much as the Americans. Though their overall scores were not quite as high, the pattern of correct responses and mistakes was the same, with both groups confusing the same chips in the same ways (Heider 1972).

Follow-up studies confirmed the demise of a culturally relativistic theory of color perception. When presented discrimination tasks using nearly identical colors, some of which fell on opposite sides of linguistic color lines and some of which were on the same side, neither American nor Dani subjects showed any effects of language influencing perception. Moving from color perception to a wide range of classification domains, Bosch and her colleagues found that the cultural-linguistic view of such procedures failed again and again. In most cases, it seems, there is no explicit or implicit set of distinguishing criteria that cause an item to be included or excluded from a category.

Human classification appears instead to follow a sort of "fuzzy logic" (McKean and Dworetzky 1985), with a variety of criteria contributing to a sense of *degree* of membership in a group. Classification in the tasks this group studied is not a procedure for determining if an item fits into this group or that, but rather one of assessing how closely the item resembles a prototypical group member. If groups are defined at all in the act of classifying, it is in reference to this prototype, not to a set of criteria and rules (Gardner 1985).

Systems of classification, then, may not be culturally determined but may instead depend on: (1) innate cognitive mechanisms, (2) an undeniable structure of the world of phenomena that simply impresses itself upon our minds, or (3) some combination of the two. It should be noted that two centuries ago Immanuel Kant faced the same dilemma when he made his famous synthesis of the empirical/materialist and rationalist/idealist philosophies in *The Critique of Pure Reason*, a work that remains one of the most powerful theses of epistemology ever conceived (Durant 1926). And yet the issue is far from resolved.

At the same time Rosch was studying color perception among the Dani, Berlin and Kay (1969) were in a different way examining cross-cultural color-naming, using subjects speaking 20 diverse languages. They found unexpected agreement in what constituted a "good green" or a "good red," even when the language lacked a name for such a color grouping. They attribute this to the basic structure of the nervous system. Perhaps more remarkable was the fixed order they discovered in the ways languages increased their stock of color terms. The 98 groups studied had a range of 2 to 11 basic color words. They found that, given the number of such words in a language, they could accurately predict what those terms would be. For example, if there were only two colors, they would be the equivalents of black and white. The third term added was consistently red, then yellow and green, followed by blue and brown, with purple, pink, orange, and gray the last to be added to a culture's lexicon of color. These findings, they hypothesize, also reflect underlying neurophysiology.

Clearly, then, in many domains classification is not simply a process of establishing criteria and applying them to sort items into sets of neatly distinguishable categories. Nor can it be denied that in some domains, such as classifying higher-order constructs that have no tangible referents, learning and thinking supersede neurophysiology and brain architecture. Classification is certainly more complex and more difficult to, well, *classify*, than it once seemed.

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Ideally, it may be best, as Sternberg (1986) argues, to provide direct instruction in thinking skills as a separate course and to encourage "infusion" by regular classroom teachers as much as possible. A helpful analogy[10] might be drawn to the ways writing is taught in most schools. Writing skills are generally the focus of instruction in only one area—English—with other content areas providing opportunities for students to practice and develop these skills in a variety of contexts. A thinking skills program can be designed in the same way. This allows selection of the most adept teachers of thinking as primary thinking skill instructors, although even they must be wary of mistaking instruction for learning and thinking skills for thinking. Assigning a small number of teachers to specialize in teaching thinking enables a district to make available in-depth training programs with coaching and other follow-up procedures, thereby empowering those who are most likely to be successful without forcing those most likely to do the job poorly.

The Long-Term Goal

There is much that can and should be done in the teaching of thinking, the caveats of this paper notwithstanding. As we do these things, we need to recognize that much of what we are doing is not based on clear understandings of how people think—which should keep our claims humble and our minds open to both new techniques and new ways of thinking. We must emphasize the importance of assessing student thinking before providing instruction, keeping in mind that whatever approach "works" in the short-run, the long-term goal is to produce independent critical thinkers, not teacher-directed information processors.☐

1. For an excellent history of cognitive science and its roots, see Gardner (1985).

2. Because of the confusion of ways in which it is used, I have avoided the word "metacognition." Readers may note that several of the strategies described in this paper are referred to elsewhere as "metacognitive" techniques.

3. Sternberg also acknowledges the importance of internalized thought processes but confesses doubt as to how this process occurs (Sternberg 1984).

4. *Conscious* is used here in reference to thought processes of which the thinker is or can easily become aware. The range of meanings that this word spans—from merely *awake* to the much more narrow *aware*, with *alert* somewhere in between—is an unfortunate source of confusion. Regrettably, there are no clearly defined alternatives, and introducing the distraction of a neologism might only make matters worse.

5. In some programming languages (e.g., Pascal and Fortran) the entire program is first translated, then run in machine language.

6. Jay McTighe uses the example of running to demonstrate a skill that develops naturally—without instruction—and yet can be much improved by skillful coaching. Presentation to teachers of Washington County, Maryland, November 1986.

7. A most impressive example of this is the Indian mathematician Srinivasa Ramanujan, who believed his ideas were gifts of the goddess Namagiri—and who produced with this inspiration many brilliant theorems in a maddeningly intuitive way (Hofstadter 1979). An equally impressive example—this one involving conscious control of a remarkable feat of unconscious thought—is Nikola Tesla's ability to draw fine mental blueprints of machines he imagined and then set the machines running—in his mind. He explained that he would let them run, in the back of his mind, for a period of several weeks, checking back occasionally for signs of wear (Amabile 1983).

8. This is rather like testing writing skill by asking students to list rules of grammar. Wolfthal (1986) makes an interesting case for teaching grammar because it is fascinating but asks teachers to stop pretending that learning rules of grammar will help students write better. The evidence we have about thinking suggests that examining how we think does help develop thinking in at least some cases, but we might do well to follow Wolfthal's lead in emphasizing more the inherently interesting nature of such processes.

9. Richard Paul (1986) suggests that we educate teachers to make them "material proof," by which I understand him to mean teachers who could teach successfully in spite of poor texts and curricular materials. It is hard not to agree with this—but in the meantime, we must keep in mind the dispositions, abilities, and attitudes of the teachers who will in fact be called upon to implement thinking skills programs.

10. For which I am again indebted to Jay McTighe, personal communication, December 1986.

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