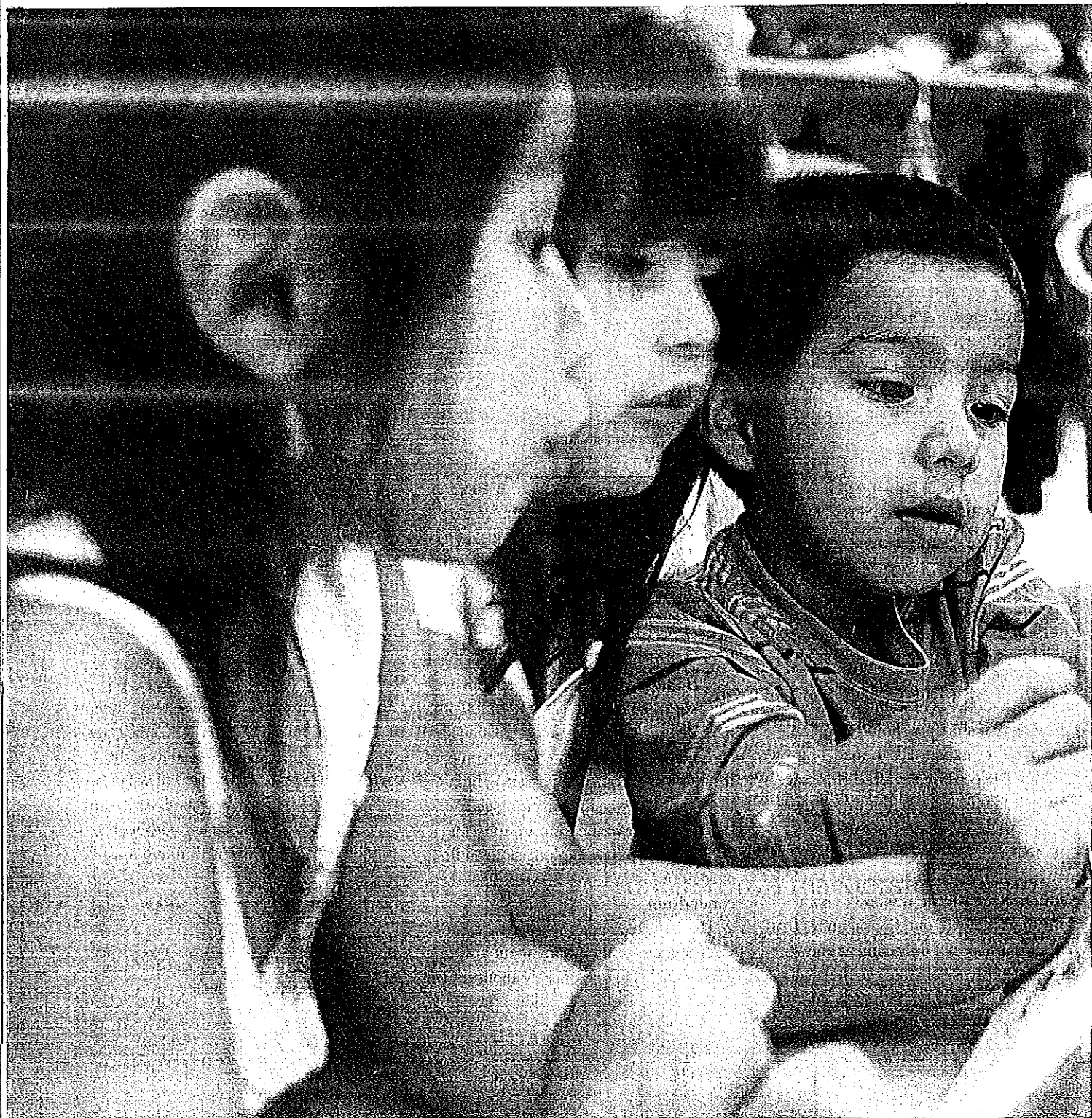


All Our Students



Thinking

Any subject—be it physics, art, or auto repair—can promote critical thinking as long as teachers teach in intellectually challenging ways.

Nel Noddings

One stated aim of almost all schools today is to promote critical thinking. But how do we teach critical thinking? What do we mean by *thinking*?

In an earlier issue on the whole child (September 2005), *Educational Leadership* made it clear that education is rightly considered a multipurpose enterprise. Schools should encourage the development of all aspects of whole persons: their intellectual, moral, social, aesthetic, emotional, physical, and spiritual capacities. In this issue, I am primarily concerned with intellectual development, in particular, with teaching students to think. However, as we address this important aim, we need to ask how it fits with other important aims, how our choice of specific goals and objectives may affect the aim of thinking, and whether current practices enhance or impede this aim.

Thinking and Intellect

Writers often distinguish among such thinking categories as critical thinking, reflective thinking, creative thinking, and higher-order thinking. Here, I consider thinking as the sort of mental activity that uses facts to plan, order, and

work toward an end; seeks meaning or an explanation; is self-reflective; and uses reason to question claims and make judgments. This seems to be what most teachers have in mind when they talk about thinking.

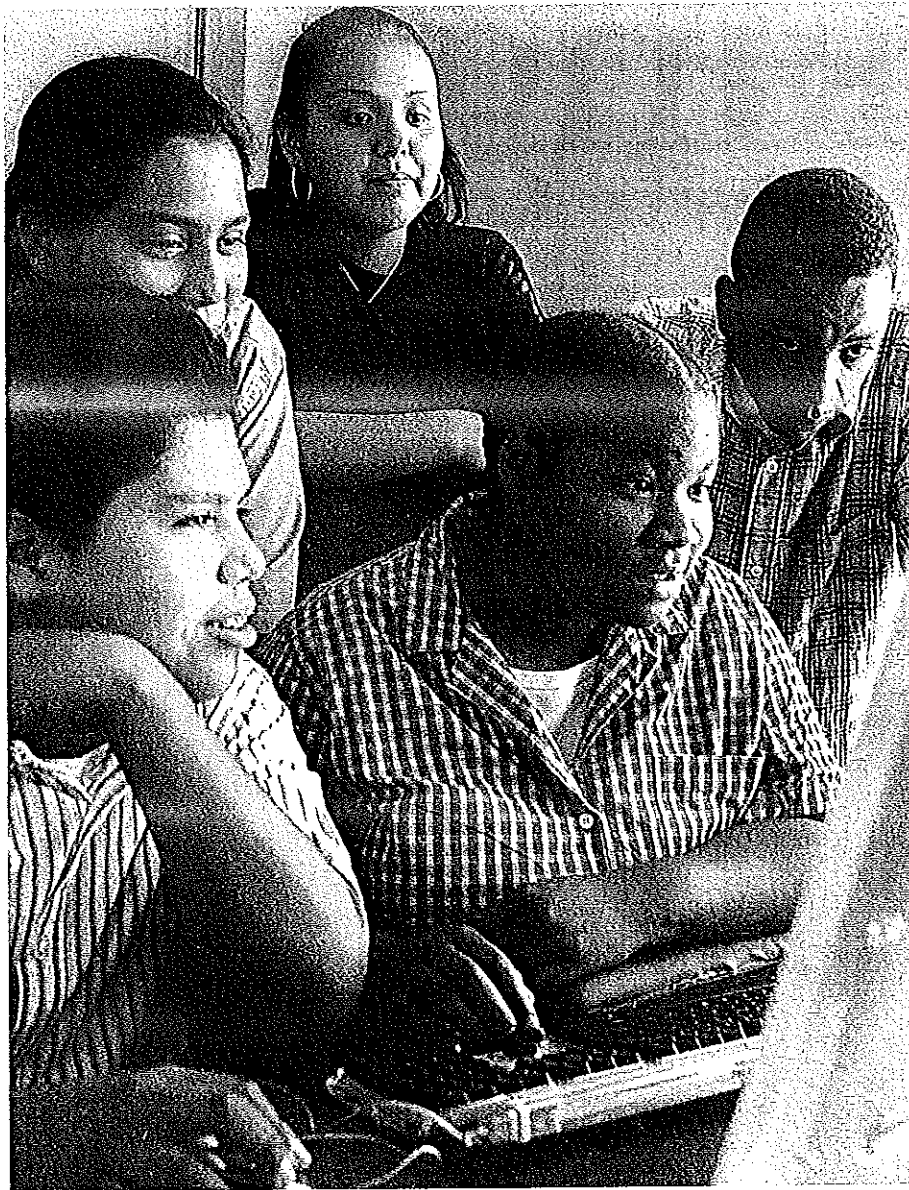
For centuries, many people have assumed that the study of certain subjects—such as algebra, Latin, and physics—has a desirable effect on the development of intellect. These subjects, it was thought, develop the mind, much as physical activity develops the muscles. John Dewey (1933/1971) rejected this view, writing, “It is desirable to expel . . . the notion that some subjects are inherently ‘intellectual,’ and hence possessed of an almost magical power to train the faculty of thought” (p. 46). Dewey argued, on the contrary, that

any subject, from Greek to cooking, and from drawing to mathematics, is intellectual, if intellectual at all, not in its fixed inner structure, but in its function—in its power to start and direct significant inquiry and reflection. What geometry does for one, the manipulation of laboratory apparatus, the mastery of a musical composition, or the conduct of a business affair, may do for another. (pp. 46–47)

More recently, Mike Rose has shown convincingly not only that thinking is



© SUZIE FITZMAURICE



Children movement, remarked,

School administrators are calling for ways of “infusing thinking into the curriculum,” apparently on the understanding that thinking can be added to the existing courses of studies as easily as we add vitamins to our diet. (p. 2)

But thinking cannot be formulated as a lesson objective—as something to teach, learn, and evaluate on Thursday morning. How, then, do we go about it?

Learning as Exploration

A few years ago, I watched a teenager whom I’ll call Margie struggle with courses that discouraged thinking. In her U.S. history course, students were required to learn a list of facts for each unit of study. Margie had to memorize a set of 40 responses (names, places, and dates) for the unit on the American Revolutionary War and the postwar period. Conscientiously, she memorized the material and got a good grade on the test. When I talked with her, however, it was clear that she had not been asked to think and would soon forget the memorized facts. None of it meant anything to her; passing the test was her only objective.

Suppose, instead, that the teacher had asked students to consider such questions as these:

- What happened to the Tories during and after the war?
- Why was Thomas Paine honored as a hero for his tract *Common Sense* but reviled for his book *The Age of Reason*?
- Why might we be surprised (and dismayed) that John Adams signed the Alien and Sedition Acts?

Such questions would encourage students to read, write, argue, and consider the implications for current political life—all important aims of education. How many Tories left the United States? Where did they go? Where do refugees go today? Discussing the question on Thomas Paine could lead to a critical discussion of both

required in physical work (2005), but also that nonacademic subjects can be taught in intellectually challenging ways (1995). We do our students and society a disservice when we suppose that there is no intellectual worth in such subjects as homemaking, parenting, getting along with others, living with plants and animals, and understanding advertising and propaganda (Noddings, 2005, 2006). The point is to appreciate the topics that matter in real life and encourage thinking in each area. This is

not accomplished by first teaching everyone algebra—thus developing mental muscle—and then applying that muscle to everyday matters.

Nor is it accomplished by simply adding thinking to the set of objectives for each disciplinary course. More than 20 years ago, educators and policymakers advocated greater emphasis on thinking as an aim of education. Commenting on this popular demand, Matthew Lipman (1991), one of the founders of the modern Philosophy for

nationalism and religion centered on Paine's statement, "My country is the world; my religion is to do good." Who reviled Paine and why? After reading biographical material on John Adams, students might indeed be amazed that he signed the Alien and Sedition Acts. What lesson might we take from this story about the effects of fear and distrust on even highly intelligent people?

Algebra for Some

When I first met with Margie, she was taking algebra. Looking through her textbook, I thought the course would be

Students should be able to choose a nonacademic program with pride and confidence.

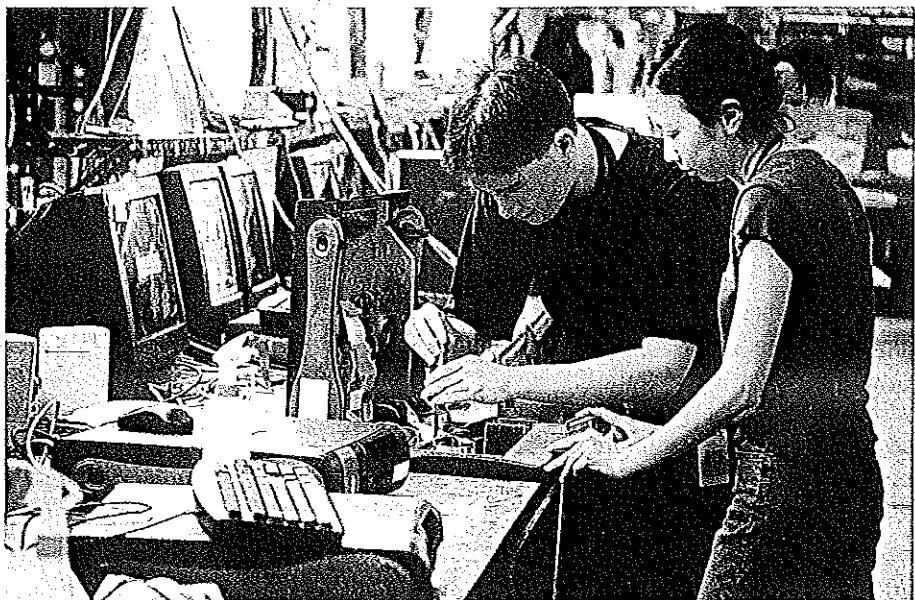
wonderful. The textbook was loaded with real-world applications and exercises that invited genuine thinking. But the teacher did not assign even one of these exercises. Not one! The following year, in geometry, Margie was never asked to do a proof. These algebra and geometry classes were composed of kids who, had they had a choice in the matter, would not have chosen courses in academic mathematics. Today, in the name of equality of opportunity, we force nearly all students into courses called Algebra and Geometry, but the courses often do not deserve their names because they lack genuine intellectual content. This practice is little short of pedagogical fraud. Many of Margie's classmates (and Margie, too) would have been better served by good career and technical education courses that would

challenge them to think about the world of work for which they were preparing.

I am not suggesting that we go back to a system in which students are tested, sorted, and assigned either to academic courses or dead-end tracks in which they are treated with neglect, sometimes even with contempt. But the present practice of forcing everyone into academic courses is not working well. We would do better to design excellent career and technical education courses—

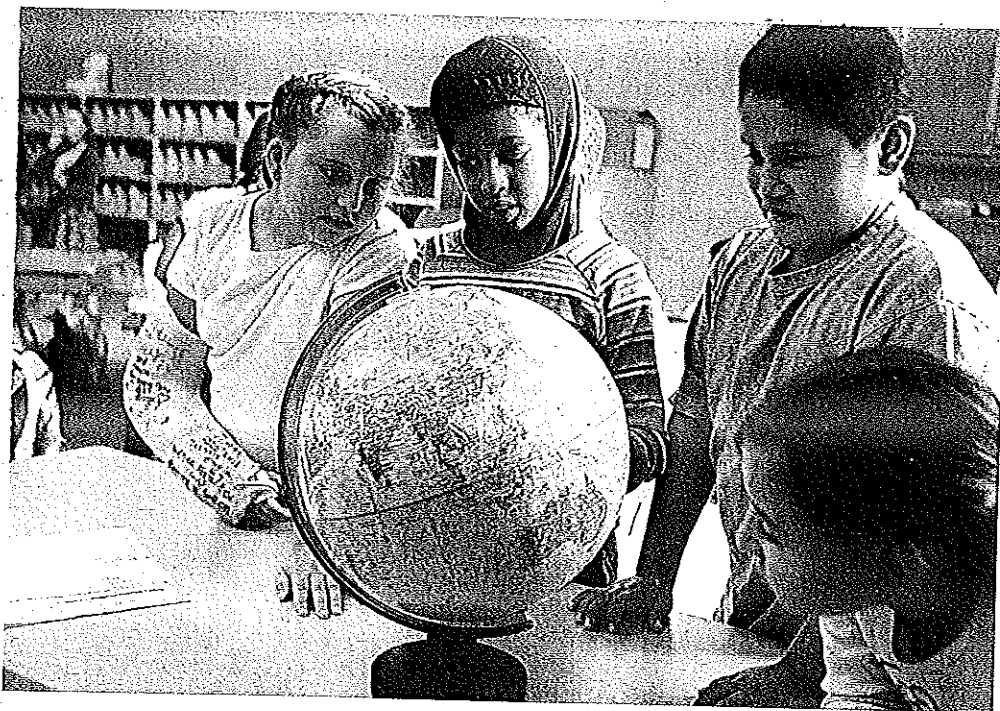
badly needs workers with high technical skills (Monastersky, 2007).

We can give students opportunities to think well in any course we offer, provided the students are interested in the subjects discussed. Algebra can be taught thoughtfully or stupidly. So can drafting, cooking, or parenting. The key is to give students opportunities to think and to make an effort to connect one subject area to other subject areas in the curriculum and to everyday life.



very like the job-oriented programs provided in two-year colleges—and allow students to choose their own course of study. Students should not be forced into or excluded from academic courses, but they should be able to choose a nonacademic program with pride and confidence. Such programs are available in many Western countries, such as Germany and the Scandinavian countries. Programs like these might offer courses to prepare machinists, film technicians, office managers, retail salespersons, food preparation and service workers, mechanics, and other skilled workers. Recent studies have shown that the United States actually has an oversupply of engineers and scientists but

Consider the ongoing debate over popular science versus "real science." Many critics scorn popular science courses (for a powerful criticism of the critics, see Windschitl, 2006). They would prefer to enroll all students in science courses that would prepare them—through emphasis on vocabulary and abstract concepts—for the next science course. According to this view, practical or popular science has little value and should certainly not carry credits toward college preparation. But intelligent, well-educated nonscientists depend on popular (or popularized) science for a lifetime of essential information. Nonscientists like myself cannot run our own experiments and verify every-



© SUSIE FITZUGH

thing that comes through the science pipeline. Instead, we read widely and consider the credentials of those making various claims. High school courses should prepare not only future specialists but also all students for membership in this circle of thoughtful readers.

Deference to the formal disciplines sometimes actually impedes student thinking. A few years ago, it was recommended that math courses should teach students how to think like a mathematician. In science courses, they were to think like a scientist; in history, like a historian, and so on. But aside from the possibility that there may be more than one way to think like a mathematician, education efforts might better be aimed at showing students how to use mathematics to think about their own purposes. For example, carpenters don't need to think like mathematicians, but they do need to think about and use mathematics in their work.

Modeling Open-Ended Thinking

It may be useful, however, for students to see and hear their teachers thinking as

mathematicians, historians, or artists. When I was studying for my master's degree in mathematics, I had one professor who frequently came to class unprepared. His fumbling about was often annoying; he wasted time. But sometimes his lack of preparedness led to eye-opening episodes. He would share aloud his thinking, working his way through a problem. Sometimes he would stop short and say, "This isn't going to work," and he'd explain why it wouldn't work. At other times, he'd say, "Ah, look, we're going great! What should we do next?" He modeled mathematical thinking for us, and I found it quite wonderful. The process was messy, uneven, time-consuming, and thrilling. That's the way real thinking is.

I am not recommending that teachers come to class unprepared, but we should at least occasionally tackle problems or ideas that we have not worked out beforehand. In doing so, we model thinking and demonstrate both the obstacles that we encounter and our successes.

Too often, we state beforehand exactly

what we will teach and exactly what our students should know or do as a result. This is the right approach for some objectives. There is a place for automatic response in student learning; we do want students to carry out some operations automatically, without thinking. That sort of skill frees us to think about the real problems on which we should concentrate.

In today's schools, however, too much of what we teach is cast in terms of specific objectives or standards. Margie was told the 40 things she was expected to know about the American Revolutionary War. Some educators even argue that it is only fair to tell students exactly what they must know or do. But such full disclosure may foreclose learning to think. Thinking involves planning, ordering, creating structural outlines, deciding what is important, and reflecting on one's own activity. If all this is done for students—CliffsNotes for everything—they may pass tests on material they have memorized, but they will not learn to think, and they will quickly forget most of the memorized material.

Encouraging Teachers to Think

Our focus thus far has been on students. But what about teachers? Are they encouraged to think? Unfortunately, many teachers are told what topics to teach and how to teach them. In too many cases, they are even compelled to use scripted lessons. Ready-made lessons should be available for teachers who want to use them or for special purposes, but professional teachers should be allowed—even encouraged—to use their professional judgment in planning lessons and sequences of lessons.

If teachers want to teach students to think, they must think about what they themselves are doing. Critics both inside and outside the United States have characterized the U.S. curriculum as "a mile

wide and an inch deep." The pressure to cover mandated material can lead to hasty and superficial instruction that favors correct responses to multiple-choice questions over thinking. Countless teachers have told me that they can't spend time on real-life applications of mathematics or the kinds of questions I suggested for Margie's history class. If they were to do so, they tell me, they wouldn't get through the required curriculum. But what is the point of getting through a huge body of material if students will soon forget it? How can we claim to educate our students if they do not acquire the intellectual habits of mind associated with thinking?

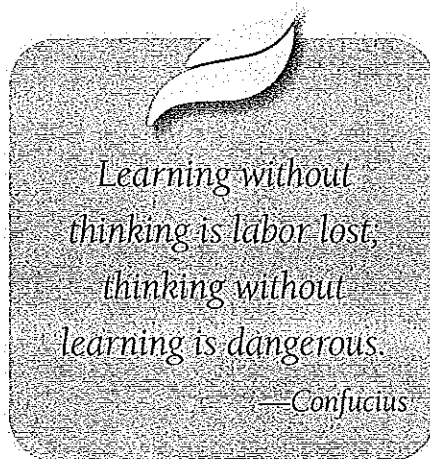
Teachers should also be willing to think critically about education theory and about what we might call education propaganda. Slogans are mouthed freely in education circles, and too few teachers challenge them (Noddings, 2007). For example, it is easy and politically correct to say, "All children can learn," but what does that mean? Can all children learn, say, algebra? If we answer a qualified *no* to this, are we demeaning the ability of some children (perhaps many), or might our answer be a respectful recognition that children differ and exhibit a wide range of talents and needs?

What Competing Really Means

Even if we believe that all children can learn algebra, we too seldom ask the question, Why should they? When we do ask it, the answer is usually that we live in an information age and that if students (and the United States) are to compete in a worldwide economy, they must know far more mathematics than previous generations did. We need, they say, more college-educated citizens.

Is this true? The information world is certainly growing, but in addition to its own growth, it has generated an enormous service world, and people in this world should also learn to think. The

Bureau of Labor Statistics provides charts showing that, of the 10 occupations with the most openings in the next decade, only one or two require a college education. Occupations such as food preparation and service worker, retail salesperson, customer service representative, cashier, office clerk, and laborer and material mover will employ about five times more people than the computer/high-tech fields requiring a college education (see www.bls.gov/emp/home.htm for employment projections). No matter what we do in schools, most



of our high school graduates will work at such jobs.

We live in an interdependent society, and one of our education aims is to prepare students for democratic citizenship. As part of that task, we should help students develop an appreciation for the wide range of essential work that must be done in our complex society. In the future, not everyone will need to have a traditional college education to experience occupational success, although postsecondary education or training will frequently enhance that success. Rather, occupational success will require flexibility, a willingness to continue learning, an ability to work in teams, patience and skill in problem solving, intellectual and personal honesty, and a well-developed

capacity to think. Success in personal life requires many of the same qualities.

Even for those who go on to college and postgraduate education, the intellectual demands of the future are moving away from a narrow disciplinary emphasis. The biologist E. O. Wilson (2006) has commented on the new demands:

The trajectory of world events suggests that educated people should be far better able than before to address the great issues courageously and analytically by undertaking a traverse of disciplines. We are into the age of synthesis, with a real empirical bite to it. Therefore, *sapere aude*. Dare to think on your own. (p. 137)

That's good advice for both teachers and students. ■

References

- Dewey, J. (1933/1971). *How we think*. Chicago: Henry Regnery. (Original work published 1933)
- Lipman, M. (1991). *Thinking in education*. Cambridge, UK: Cambridge University Press.
- Monastersky, R. (2007, November 16). Researchers dispute notion that America lacks scientists and engineers. *The Chronicle of Higher Education*, 54(12), A14-15.
- Noddings, N. (2005). *The challenge to care in schools* (2nd ed.). New York: Teachers College Press.
- Noddings, N. (2006). *Critical lessons: What our schools should teach*. New York: Cambridge University Press.
- Noddings, N. (2007). *When school reform goes wrong*. New York: Teachers College Press.
- Rose, M. (1995). *Possible lives: The promise of public education in America*. Boston: Houghton Mifflin.
- Rose, M. (2005). *The mind at work: Valuing the intelligence of the American worker*. New York: Penguin.
- Wilson, E. O. (2006). *The creation: An appeal to save life on earth*. New York: Norton.
- Windschitl, M. (2006). Why we can't talk to one another about science education reform. *Phi Delta Kappan*, 87(5), 348-355.

Nel Noddings is Lee L. Jacks Professor of Education, Emerita, at Stanford University, Stanford, California; noddings@stanford.edu.