

Reflections on Critical Thinking in Secondary Schools

We can revive the spirit of inventiveness by allowing students the freedom to consider the unconventional and probe the possibilities of the impossible.

JOHN BARELL

While listening to his high school psychology teacher lecture on the characteristics of good leaders, Juan visualized himself in the Marines. In his imagination, he was face to face with a tough drill sergeant who was giving him an order he didn't like. When the class ended, Juan told me what he had been thinking about. "I've got a big mouth," he said. "I'd probably disagree, get into trouble, and go AWOL."

Juan wasn't just daydreaming during the discussion. He was engaged in what Einstein called "combinatory play" with ideas, "the essential feature in productive thought."¹ Playing with ideas is the outgrowth of child's play and often results in novel ideas, new perspectives, and hypotheses worth discussing. If Juan had had an opportunity to discuss his thoughts, he might have come up with an alternative course of action that could have affected his attitude toward leadership problems in the future. Toying with images and ideas is an important source of inventiveness in our schools—inventions of new ways of thinking and acting. This imaginative play is an essential component of reflective thinking.

Imagination is the ability to transcend conventional and accepted ways of thinking and acting to transform facts, ideas, and concepts into novel combinations. It is the ability to form, manipu-

late freely, and react emotionally to images in the mind. In a very real sense, it is the foundation of all thinking² and the source of all the concepts in the subjects we teach in schools.

For Einstein, imagination was equally important to formal logic: thinking in "more or less clear images" or playing with ideas must occur "before there is any connection with logical construction in words or other kinds of signs which can be communicated to others." At the age of 16, Einstein visualized himself riding along a ray of light at 186,000 miles per hour wondering what he would notice about the nature of light. Ten years later his "combinatory play" with ideas resulted in the special theory of relativity.

Reflective thinking can, therefore, be seen as a combination of imaginative leaps away from concrete and logical thought that proceeds in linear fashion from premises toward conclusions. It is this key element of imagining that allows us to go "beyond what has been thought, said, and done before. . . ."

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This is the Rockefeller Report's definition of critical thinking, a priority it has recommended for secondary schools in the years ahead and a basic skill "for the creation of a future."³ Imagining is essential in the sciences as well as the humanities and ought not be confined to creative writing and art classes.

I have observed many examples of combinatory play, both in and out of classrooms. In the following examples, the students were involved in highly imaginative, inventive, and critical thinking about subject matter, although they may have appeared to be daydreaming or totally uninvolved.

During a U.S. history lesson, Bob, a high school junior, listened as the teacher asked questions about the qualifications of members of Congress and the President as specified in the Constitution. While the questioning proceeded, Bob thought, "There's an awful lot you can read into the Constitution. I'd like to discuss the naturalization loophole. I wonder if Jimmy Carter could be considered to come from a foreign country. To people in Maine or California, he's about as foreign as Kissinger will ever be. So every section of the country can be considered foreign depending on your location."

Bob's speculation about Carter was valid because of the former President's rather poor relations with the Washing-

ton establishment. Bob's playing with ideas was facilitated by a characteristic of productive thinkers—flexibility—that enabled him to say “depending on your location” or point of view. Such flexibility also reflects the development of abstract thinking that emerges during adolescence. Bob's transcending the denotative meanings of “foreign” is somewhat like Newton's speculation on the relationship between the falling apple and the moon's “falling” about the earth in orbit. They both leapt away from the concrete toward the possible.

Marie, a senior, listened to her anthropology teacher describe the theory of continental drift, showing on a map how Africa and South America seemed to fit together like pieces of a puzzle. She thought to herself: “I wonder what would happen if they continued to drift apart?”

Here is another curiosity about the mysterious, a wondering about the unknown that Einstein called “the fairest thing we can experience. . . . it stands at the cradle of true science. He who knows it not and can no longer wonder, no longer feels amazement, is as good as dead.”⁴ Marie's envisioning was similar to Carl Sagan's envisioning the possibilities of life in other galaxies. Her knowledge of science and human nature could have led to an interesting array of conclusions, exemplifying Piaget's notion of “if-then” thinking in the formal stage of operations. Her way of looking at the world might also have changed—a salient outcome of hypothetical thinking.⁵

Lisa, a senior, sat in a health class watching a film about schizophrenia. The narrator explained that the schizophrenic is not a “split personality,” but a person who, when the world becomes too much, flees to a world of his or her own creation. In one sequence a doctor asked a 27-year-old patient, “How old would you like to be?”

“Fifty-five,” the patient responded.

“Why?”

“I'd be closer to death.”

In another sequence, patients imagined that lice and vermin were crawling over their bodies. Later, I asked Lisa what she was thinking during the film.

“I thought it was weird that some people would think of animals crawling on their forehead. I felt sorry for the guy who wanted to be 55—there's so much

he's missing. I thought he would want to be eight, not the other way around. The film reminded me of *One Flew Over the Cuckoo's Nest*—the people with hands on someone's back like a choo choo. I wondered if they realized they were ill. Did they feel ashamed of being in that room? I'd feel pretty bad. I wondered how in touch with reality they are. They must feel sorry for themselves.”

Lisa's empathy took her into the minds of the people in *Cuckoo's Nest* to speculate about their self-perceptions, perhaps after asking herself how she might feel in that situation—“I'd feel pretty bad.” This is the kind of thinking some historians engage in, projecting themselves imaginatively into the characters they study. As R. G. Collingwood noted, what historians know are “past thoughts.” They know them by “rethinking them” themselves, thereby acquiring knowledge of the historical situations and of themselves.⁶ Lisa's speculations on the patients in the two films and Collingwood's rethinking Lord Nelson's thoughts at the Battle of Trafalgar are the same process—each involving imaginative leaps away from themselves.

These reflections on content and the student's own experiences were stimulated by my asking: “What were you thinking during the presentation?” and “What did this make you think of?” Seldom were students challenged to relate facts or ideas to their own experience to enrich the meaningful associations possible and stimulate inquiry within the classroom.

Since hypothetical thinking is characteristic of mature and critical thinkers, I often pose “What if” situations to elicit the quality of students' thinking and to determine the degree to which they engaged in “formal thought” that might reflect combinatorial play with ideas.

I asked Betsy, an advanced chemistry student, “What would it be like to sit in the center of an atom, surrounded by the electrons?” She replied, “I see myself on this very solid nucleus, with an electron out there zooming around it, taking many different paths, protecting it. Going very, very fast. I hear whirring, vibrating sounds.”

Applying her prior knowledge, Betsy generated visual images complete with

sound, a process fundamental to scientific inquiry. Joshua Lederberg, winner of the Nobel Prize for discoveries in the genetics of microorganisms, noted:

One needs . . . the ability to imagine oneself inside a biological situation: I literally had to be able to think, for example, “what would it be like if I were one of the chemical pieces in a bacterial chromosome” and try to understand what my environment was, try to know where I was, try to know when I was supposed to function in a certain way, and so forth.⁷

This was Copernicus' method of establishing the plausibility of the heliocentric view of the solar system, by projecting himself into the sun to observe the planets from that vantage point.⁸ Imagination offers us the different perspective or “location” that Bob referred to.

I asked Lisa, “What would happen if we discovered that atoms were inhabited by thinking beings?” She responded, “We'd start a humane movement. It might convince us of the probability of people in outer space. It would open a new field of science—people living inside of people. The earth could be a big atom in a huge creature. We'd be like a box within a box—like the children's toy. Atom is to person as person is to another creature.”

Here is a new theory, or the possibility of one, generated from an absurd proposition that places human beings in an entirely novel perspective through the use of metaphoric language.

Tim, another senior, responded to the same question, “The word ‘it’ would have a different meaning.” Tim's idea causes us to rethink the separation of humankind from nature so characteristic of our technological era. Lisa's and Tim's imaginativeness, therefore, results in their reconceptualizing their views of themselves in the world.

What do these examples of students' thinking reveal?

1. Each example discloses high levels of cognitive processing that are fundamental to reflective thought. Only three of the six students were above average academically, so there is reason to suspect that the average student, not only the gifted and talented, is, at times, engaged in critical thinking.

2. Each reveals the act of learning—what Piaget called “acting upon” content, a process of combining and rear-

-ranging facts and ideas that might result in personal inventions and idiosyncratic ways of looking at ourselves and our world.

3. In all cases, they reveal to us the stages of cognitive and, in Lisa's case, affective and moral development. How useful hypothetical questioning would be were our curriculum predicated on the long-term development of intellectual and emotional abilities and relationships, rather than on high test scores. But cognitive and affective development here reflect what Eisner has called "the null curriculum": what is not taught in schools.⁹

4. While playing with ideas, these students were also making them meaningful. They are relating new information to their previous experiences, some within the subject discipline and others to experiences rather different. Cognitive psychologists such as Richard Mayer have created theories of learning predicated on taking in information, ensuring that prerequisite skills and knowledge exist, and then relating this

information to the entire spectrum of one's previous experiences.¹⁰ Such strategies improve students' abilities to transfer skills to novel problems and solve them better than if they merely "bank" and withdraw facts. Meaningfulness, referring to connections or relations we establish among facts or ideas, certainly is an example of the "null curriculum" when it includes personal meanings.

In sum, these examples reveal the kind of reflective thinking required for human growth and development. Yet such thinking is often overlooked or neglected. What must we do to establish the circles of involvement where imaginative thinking can flourish?

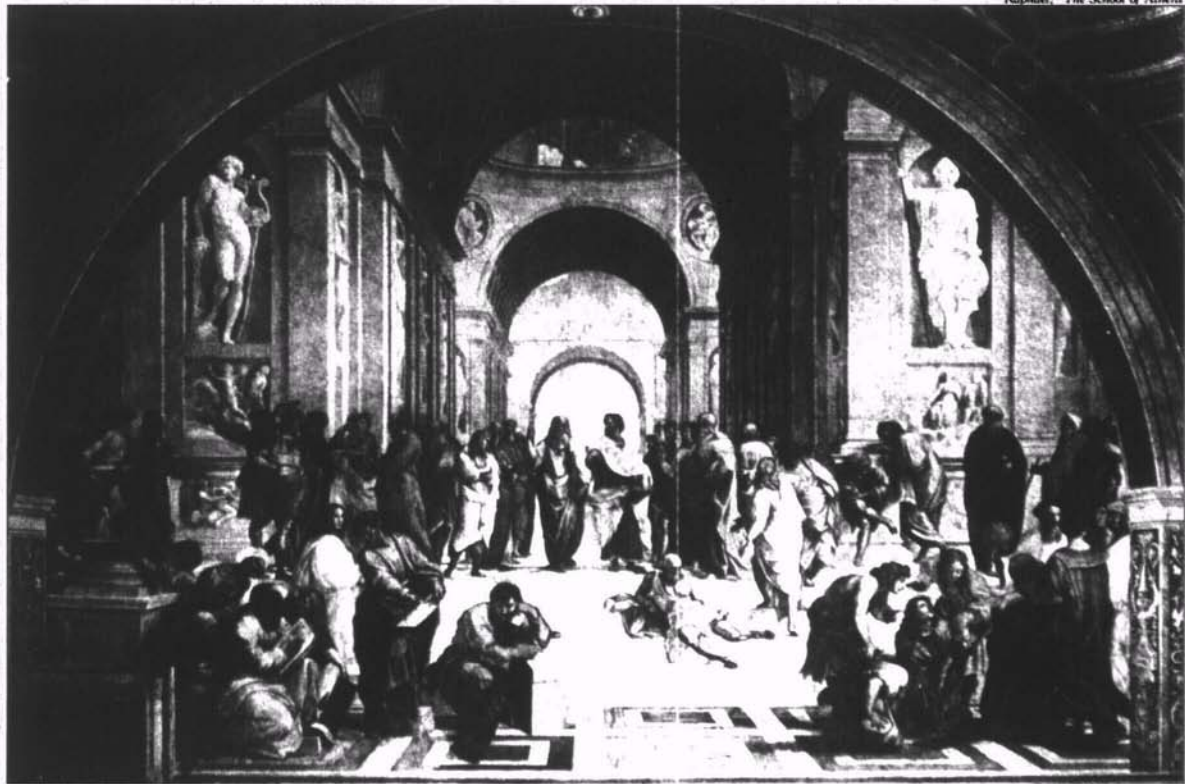
As teachers we have to assess our students' thinking abilities at some point. By asking a question such as "What happens if all the ice in Antarctica melts?" we are able to elicit responses that range from the very concrete to the more or less abstract. When Tim replied, "Venice would no longer be unique!" I had a clue about his

ability to transcend the immediate situation to make comparisons that required abstracting essential elements or characteristics from experiences. This is an example of Piaget's formal operations.

We must open the intellectual spaces for exploration of thought-provoking problems. We should view our students not so often as information consumers but more often as *thinkers* capable of fashioning new meanings and examining problems from different perspectives. Developing such flexibility of perspective over time will challenge students to transcend the concrete and obvious approaches to problems, thereby fostering their emerging abstract thinking capabilities.

We must create an environment in which students feel comfortable sharing their ideas, inventions, and personal meanings—an environment characterized in Raphael's *The School of Athens*.¹¹ The figures in the right foreground appear to be engaged in combinatory play with ideas. The characters' interlocking gestures, the play of

Raphael, "The School of Athens"



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eyes on each figure, and the geometry of their spatial arrangement all contribute to the circle of involvement. Raphael placed Plato and Aristotle at the focal point, surrounded by towering arches to provide an enduring framework for the wide diversity of human activity depicted here. The solid architectural background gives the necessary structure within which inquiring minds can flourish. The same is true of classrooms. Students must have clearly delineated sets of expectations, not only for routine behaviors, but for thinking as well. Listening, sharing, and empathizing are also important ingredients in enriching learning experiences. They are, in addition, skills that require extensive re-learning experiences, especially when one has been used to the teacher as an information dispenser. In a New Jersey staff development project (THISTLE—Thinking Skills in Teaching and Learning) designed to help teachers stimulate critical thinking among students, one teacher noted, "What I've had to learn most of all is to be patient with my students' struggling with new thoughts—and that isn't easy."

Listening creates something else of value: "The widening of the area of shared concerns and the liberation of a greater diversity of personal capacities."¹² Dewey gives us one of the reasons for engaging students in reflective thinking: to create within the classroom a sense of community and participation where the culture is preserved and new perspectives are developed, shared, and critiqued. This sense of communal sharing is dramatized in *The School of Athens* where young and old alike are invited to engage in what Aristotle saw as the ultimate goal in life: rational thought.

The "widening of our shared concerns" can be stimulated by liberating students' imaginative thinking from al-

most total reliance on the authority of the textbook and the recall-comprehension questions that predominate. And such sharing ought to involve all students, not just the gifted and talented. All students can respond to questions such as "What if all the ice in Antarctica melted?" or "What if we discovered that atoms were inhabited by thinking beings?" Some teachers have been very surprised at the novel ideas generated by some of their quieter students. "A lot of political prisoners would be free if the ice melted," said one rather reticent girl in Newark—a serendipity for her teacher.

Of course, there are many impediments encountered when we attend to the imaginative and critical thinking of our students: the press for high achievement without undue risk; the back-to-basics trend that stresses drill and recitation at the lower cognitive levels; the ever present need to "cover" content necessitating rapid movement from one idea to the next; the lack of rewards from administrators and supervisors in some cases; and our own instructional empiricism, which suggests that what we can know comes from what is observable and measurable, from what already exists and not from what is possible or nonexperiential. An example of this empiricism comes from Simon Ramo, a pioneer in microwave electronics, who asked his history teacher, "Would there have been a Civil War . . . even if slavery had not existed?" The teacher replied, "We have enough to do to learn what actually happened without speculating on what different circumstances would have brought."

A more recent impediment comes from the press of certain segments of society for "a curriculum and an approach to teaching that clearly delineates between right and wrong" avoiding "free thought and scientific inquiry" by banning such books as *Brave New World* and *Catcher in the Rye* and others that profess "secular humanism."¹³ Succumbing to such forces would stagnate children's thinking in a concrete, immature stage of development and prevent their becoming persons who, with a leap of the imagination, can transcend the immediate situation to consider alternative ways of thinking, acting, and being. When the

curriculum separates right from wrong there will be few opportunities for students and teachers to perceive themselves as persons open to the future through an awareness of their possibilities for growth and ever novel ways of thinking.

In the end, if we wish to stimulate reflective thinking in schools, we must approach the problem from the different perspectives of curriculum, supervision, and school-parental relations. I suggest that fundamental to these perspectives and any staff development program that might result is our concept of the student. The model of the student I continually return to is Stephen Dedalus in Joyce's *Portrait of the Artist as A Young Man*. Dedalus broke away from the family, church, and country to create a new role for himself, that of the artist. He saw himself as the artificer of old, "forging anew in his workshop out of the sluggish matter of the earth a new soaring impalpable imperishable being."¹⁴

Students and teachers are like artists, recreating experience in meaningful ways, discovering and conserving the

best that has been thought and said and fashioning ideas and personal meanings through their musings on the "sluggish matter" of the curriculum. All of us, artists and scientists alike, "recreate life out of life" when we ponder, probe, and create possibilities requiring that we make decisions and reflect on the consequences. Reflective thinking, therefore, is an imaginative and critical logical process that fosters intellectual and emotional development and enriches the meaningfulness of life.□

¹Brewster Ghiselin, *The Creative Process* (New York: New American Library, 1955), p. 43.

²Hannah Arendt, "Reflections—Thinking, Part II," *The New Yorker*, 28 November 1977, p. 126.

³"The Humanities in American Life," *Report of the Commission on the Humanities* (Berkeley: University of California Press, 1980), p. 31.

⁴"The Talk of the Town," *The New Yorker*, 28 May 1979.

⁵Thomas Kuhn, "A Function for Thought Experiments," in *Thinking: Readings in Cognitive Science*, ed. P. N. Johnson-Laird and P. C. Wason (Cambridge: Cambridge University Press, 1977).

⁶R. G. Collingwood, *An Autobiography* (London: Oxford University Press, 1939), p. 112.

⁷Horace Freeland Judson, *The Search for Solutions* (New York: Holt, Rinehart & Winston, 1980), p. 6.

⁸Jacob Bronowski, *Science and Human Values* (New York: Perennial Library, 1956), p. 11.

⁹Elliot Eisner, *The Educational Imagination* (New York: Macmillan, 1979).

¹⁰Richard Mayer, "Information Processing Variables in Learning to Solve Problems," *Review of Educational Research* 45 (1975): 525-542.

¹¹James Beck, *Raphael* (New York: Harry Abrams, 1976).

¹²John Dewey, *Democracy and Education* (New York: Macmillan, 1963), p. 87.

¹³Dena Kleiman, "Parents Groups Purg-ing Schools of 'Humanist' Books and Class-," *The New York Times*, 17 May 1981, p. 1.

¹⁴James Joyce, *Portrait of the Artist as a Young Man* (New York: Viking Press, 1956), p. 169.

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