

Accelerating Change

{This document is found in *Critical Thinking: How to Prepare Students for a Rapidly Changing World*, by Richard Paul, Dillon Beach: Foundation for Critical Thinking, 1995, chapter one.}

Abstract

The goal of this chapter is to trace the general implications of what are identified as the two central characteristics of the future: accelerating change and intensifying complexity. If change continues to move faster and faster, and if the changes that do occur become more and more complex, how are we to deal with the world? More specifically, how are we to understand how this change and complexity will play itself out? How are we to prepare for it? Paul and Willson focus on the economic and educational dimensions of these questions. They lead us into and through the vision of four of our most penetrating thinkers: Robert Reich, Lester Thurow, W. Edward Deming, and Robert Heilbroner. The general thesis is that the visions of these thinkers are complementary and that collectively they provide us with a rich and pointed picture of what we must do, not because they are “visionaries,” but because they have done the profound analytic work which enables them to shed a clear light on very general patterns, all of which add up to accelerating change, intensifying complexity, and critical thinking. The chapter ends with an analysis of the implications for parenting, work, and education of the foundational fact that “the work of the future is the work of the mind, intellectual work, work that involves reasoning and intellectual self-discipline.”

The Nature of the Post-Industrial World Order

The world is swiftly changing and with each day the pace quickens. The pressure to respond intensifies. New global realities are rapidly working their way into the deepest structures of our lives: economic, social, environmental realities — realities with profound implications for teaching and learning, for business and politics, for human rights and human conflicts. These realities are becoming increasingly complex; and they all turn on the powerful dynamic of accelerating change. This chapter explores the general character of these changes and the quality of thinking necessary for effectively adapting to them.

Can we deal with incessant and accelerating change and complexity without revolutionizing our thinking? Traditionally our thinking has been designed for routine, for habit, for automation and fixed procedure. We learned how to do something once, and then we did it over and over. Learning meant becoming habituated. But what is it to learn to continually re-learn? To be comfortable with perpetual re-learning? This is a new world for us to explore, one in which the power of critical thinking to turn back on itself in continual cycles and re-cycles of self-critique is crucial.

Consider, for a moment, even a simple feature of daily life: drinking water from the tap. With the increase of pollution, the poisoning of ground water, the indirect and long-term negative consequences of even small amounts of a growing number of chemicals, how are we to judge whether or not public drinking water is safe? Increasingly governments are making decisions about how many lives to risk against the so many dollars of cost to save them. How are we to know whether the risk the government is willing to take with our lives is equivalent to our willingness to risk? This is just one of hundreds of decisions that require extraordinary thinking.

Consider also the quiet revolution that is taking place in communications. From fax machines to E-Mail, from bulletin board systems to computer delivery systems to home shopping, we are providing opportunities for people to not only be more efficient with their time, but to build invisible networks where goods, services, and ideas are exchanged with individuals the world over. But how is one to interface with this revolution? How much is one to learn and how fast? How much money should one spend on this or that new system? When is the new system cost effective? When should one wait for a newer development?

These communication innovations have re-introduced a way of life lost in the industrial revolution of the late 1800s. Farmers used to work at home, doctors' offices were routinely downstairs from where they lived. All that is coming back, not for farmers or doctors, but for millions of service and technical professionals for whom, "I work at home," is now a common refrain. But how are we to take these realities into account in planning our lives and careers?

Yes, technological growth brings new opportunities, new safety devices, more convenience, new lifestyles. But we must also juggle and judge work and child-care, efficiency and clogged transportation systems, expensive cars and inconvenient office space, increased specialization and increasing obsolescence. We are caught up in an increasing swirl of challenges and decisions.

These changes ask and offer much at the same time, if only we can make sense of them and put them into perspective. For example, what are we to make of altered forms of community, for community in a world of automatic tellers, home shopping, self-service, delivery services, malls, video rentals, and television? How shall we evaluate these social changes and their implications for our lives?

Or consider another facet of the accelerating change: that young people today can expect to make from four to seven career changes in their lifetimes. The question, "What do you want to be when you grow up?" is a poignant reminder of a vision from the past. Our children and students can no longer anticipate the knowledge or data that they will need on the job, because they can no longer predict the kinds of jobs that will be available or what they will entail.

What is more, even if the young could predict the general fields in which they will work, about half of the information that is current in each field will be obsolete in six years. Will people recognize which half? Will they know how to access and use it?

Accelerating change is intermeshed with another powerful force, the increasing complexity of the problems we face. Consider, for a moment, solid waste management. This problem involves every level of government, every department: from energy to water quality, to planning, to revenues, to public health. Without a cooperative venture, without bridging the territorial domains, without overcoming the implicit adversarial process within which we currently operate, the responsible parties at each tier of government cannot even begin to solve these problems. When they do communicate, they often do not speak honestly about the issues given the human propensity to mask the limitations of one's position and promote one's narrow but deeply vested interests.

Consider the issues of depletion of the ozone layer, world hunger, over-population, and AIDS. Without a grasp of the elements, and internal relationships of the elements, in each of dozens of interrelating systems from specific product emissions to social incentives, from effective utilization of the media to human learning, we are adrift in a stormy sea of information. Without a grasp of the of political realities, economic pressures, scientific data on the physical environment and its changes — all of which are simultaneously changing the as well — we stand no chance of making any significant positive impact on the deterioration of the quality of life for all who share the planet.

These two characteristics, then, accelerating change and increasing complexity — with their incessant demand for a new capacity to adapt, for the now rare ability to think effectively through new problems and situations in new ways — sound the death knell for traditional methods of learning how to survive in the world in which we live. How can we adapt to reality when reality won't give us time to master it before it changes itself, again and again, in ways we cannot anticipate? As we struggle to gain insight, let's look more closely at the operating forces.

Robert Heilbroner, the distinguished American economist, in *Twenty-First Century Capitalism*, identifies capitalism as a global force that brings us “kaleidoscopic changefulness,” a “torrent of market-driven change.” As he illustrates in example after example, “If capitalism is anything, it is a social order in constant change — and beyond that, change that seems to have a direction, an underlying principle of motion, a logic.” The logic, however, is the logic of “creative destruction, the unpredictable displacement of one process or product by another at the hands of giant enterprise” (p. 20).

Furthermore, along with kaleidoscopic change, along with the continual social transformations that follow from those changes, come “both wealth and misery,” development and damage, a “two-edged sword” that makes instability permanent in unpredicted and unpredictable forms. Basic change continually destabilizes the system at the micro-level, making for multiple imbalances and upheavals. The complexity and speed of change means that we shall always have to make unpredictable adjustments

to both the upsides and downsides that result from this upheaval, for we cannot hope to predict the myriad of micro-level system changes that are continually emerging and putting pressure on the system at the macro level.

We can no longer rely on the past to be the guide for the future. Technology will continually race ahead, creating links that make the world smaller and smaller. New opportunities will continually emerge but within them are embedded new problems, hence the need for acute readiness and disciplined ingenuity. At every step along the way, however, polished, satiny voices will tempt us astray with slick, simplistic messages that appear to guide us back to the “tried and true.” Often, these voices in fact coax us into policies and practices that continually sacrifice our long-term interests to someone’s short-term gain. In business, education, and politics, the same sirens echo.

Many American business and labor leaders have yet to come to terms with these realities. They yearn for a world of stability in which they can play a predictable game in a predictable way. As Laura Tyson, Chairwoman of the President’s Council of Economic Advisors has put it,

... the vast majority of American companies ... [continue] to opt for traditional hierarchical work organizations that ... [make] few demands on the skills of their workers. In fact, most American companies interviewed by the Commission on the Skills of the American Workforce continue to prefer this approach, which dooms most American workers to a low-wage future. If American workers are to look forward to anything more than low-wage employment, changes in work organization are required to upgrade their skills and productivity so that American companies can afford to pay higher wages and still compete in world markets. (“Failing Our Youth: America’s K–12 Education,” p. 52)

What our businesses are failing to change is what European and Japanese companies are changing: namely, “making their high-wage labor more productive not simply by investing in more equipment but by organizing their workers in ways that ... [upgrade] their skills.” World-class, internationally competitive companies recognize the need to play a new game and have re-organized themselves accordingly. As Tyson explains,

High productivity work-place organizations depend on workers who can do more than read, write, and do simple arithmetic, and who bring more to their jobs than reliability and a good attitude. In such organizations, workers are asked to use judgment and make decisions rather than to merely follow directions. Management layers disappear as workers take over many of the tasks that others used to do — from quality control to production scheduling. Tasks formerly performed by dozens of unskilled individuals are turned over to a much smaller number of skilled individuals. Often, teams of workers are required to monitor complicated computer-controlled production equipment, to interpret computer output, to perform statistical quality control techniques, and to repair complex and sensitive equipment. (p. 53) [our emphasis]

These new kinds of workers, of course, are not asked merely to “use judgment and make decisions,” rather they are asked to use good judgment and make well-thought-out decisions. How will workers acquire these fundamental abilities to think deeply and well? Are educators able to “make meaning” out of these exhortations of our leaders?

Bold changes in business organization and practices require parallel changes in education. Yet the U.S. public school systems, like most U.S. businesses, remain mired in the past, focused on lower order skills, and unresponsive to the need for higher order abilities. Again, as Laura Tyson puts it, “[Higher-order tasks] ... require higher-order language, math, scientific, and reasoning skills that America’s K–12 education system is not providing.”

Our students deserve at least a fighting chance to compete, to rise to the challenges of the day. Reconstructing and adapting our business and educational systems to teach our managers as well as our teachers and administrators how to create these higher order workplaces and classrooms, and then to expect them to do so in the ordinary course of their professional obligations, is our first major challenge. Today, at every level, we are failing this test, failing our students and workers, jeopardizing our future. What is missing is a genuine sense of what accelerating change entails and a shared public vision of the need for fundamental changes. Many of our leading economic analysts are struggling to create just such a new frame of reference within which we can come to terms with the new imperatives.

The Vision of Robert Reich: The Thinking of Workers as the New Capital

Robert Reich, Secretary of Labor, in his seminal book, *The Work of Nations*, offers a shocking perspective. No longer will economies be tied to the fate of national corporations. No longer will we be sheltered by the power of our enormous industrial complex, our major corporations. No longer can we say, “What is good for General Motors is good for the United States!” The new form of “wealth” will no longer principally reside in the number of dollars in American pockets. Rather it will reside in the quality of the minds of our workers. As Reich puts it,

We are living through a transformation that will rearrange the politics and economics of the coming century. There will be no national products or technologies, no national corporations, no national industries. There will no longer be national economies, or at least not as we have come to understand that concept. All that will remain rooted within national borders are the people who comprise a nation. Each nation’s primary assets will be its citizens’ skills and insights. (p. 3)

The changes triggered and fueled by new opportunities will bring an economy . . . replete with unidentified problems, unknown solutions, and unknown means of putting them together — mastery of old domains of knowledge isn’t nearly enough to guarantee a good income. Nor, importantly, is it even necessary . . . What is more valuable is the capacity to effectively and creatively use the knowledge. (p. 182)

Routinely, jobs and production, the income that those jobs generate, and its multiplying effects in commerce, are leaping national boundaries, seeking optimum conditions for competition. We are facing competition for the production work that Americans have habitually taken as their birthright. The competitors are everywhere, as growing pressures of overpopulation and environmental problems make more people willing to work for lower wages and more governments willing to offer incentives to incoming business.

Certainly, many industries are still located here in the United States; however, there is a hemorrhage of routine production work that is moving to Mexico, to Asia, to Central and South America where workers are able to produce the same product for international markets at a significant savings to the organization. U.S. workers are bewildered and afraid, watching their standard of living decline with every year.

In the emerging global economy, even the most impressive of positions in the most prestigious of organizations is vulnerable to worldwide competition if it entails easily replicated routines. The only true competitive advantage lies in skill in solving, identifying, and brokering new problems. (p. 184)

Reich claims that the distinguishing characteristic of workers who will retain their jobs will be the ability to “add value” to the production process. This translates into being able to identify and solve problems at every level relative to the job function. It means taking initiative and responsibility for the continuous improvement of production and efficiency, from the shop floor to the executive suite. To the extent that our labor force can shift into a cooperative venture with management, sharing responsibility for enhanced performance and production, jobs are more likely to be retained within our national boundaries.

The possession of capital will not in itself be a sure source of national wealth because American capital, as all other “national” capital, will be drawn to and invested in the nations where the work forces produce the highest level of return. Profit will stem from successful problem solving and brokering. Reich identifies a spiral wherein increasing opportunities for problem solving will provide the fodder for increasing our workers’ capacity to solve more and more complex problems. Mastery of each new task requires new learning, thus enhancing each worker’s capacity to contribute to the next new task.

Enhancing our capacity to solve problems will also produce more job opportunities, and up the spiral we will march as our workers continue to become better at solving the problems we face and continue to expand our inventories of skills and experience. The effectiveness and quality of our workers’ thinking will drive us up the spiral, and will provide the basis for the wealth of the nation.

But do our workers and managers see this spiral? Do we see that it is the effectiveness and quality of our thinking that enables us to climb it? What is patently clear is that the spiral flows both up and down. What is unclear is whether we have the vision and

determination to reverse our current course. Assuming we do have the will, we still need to know how to proceed.

Reich identifies four components of the kind of critical thinking that the highly-paid workers of today and the future will increasingly need to master: 1) abstraction, 2) system thinking, 3) experimentation and testing, and 4) collaboration. He calls the critical thinkers in possession of these basic abilities “symbolic analysts.” Let us look briefly at how Reich characterizes each of these four generic abilities.

Command of Abstractions

The capacity for abstraction — for discovering patterns and meanings — is, of course, the very essence of symbolic analysis, in which reality must be simplified so that it can be understood and manipulated in new ways... Every innovative scientist, lawyer, engineer, designer, management consultant, screenwriter, or advertiser is continuously searching for new ways to represent reality which will be more compelling or revealing than the old.... [But] for most children in the United States and around the world, formal education entails just the opposite kind of learning. Rather than construct meanings for themselves, meanings are imposed upon them. (pp. 229–230)

Thinking Within Systems

The education of the symbolic analyst emphasizes system thinking. Rather than teach students how to solve a problem that is presented to them, they are taught to examine why the problem arises and how it is connected to other problems. Learning how to travel from one place to another by following a prescribed route is one thing; learning the entire terrain so that you can find shortcuts to wherever you may want to go is quite another. (p. 231)

Testing Ideas

Instead of emphasizing the transmission of information, the focus is on judgment and interpretation. The student is taught to get behind the data — to ask why certain facts have been selected, why they are assumed to be important, how they were deduced, and how they might be contradicted. The student learns to examine reality from many angles, in different lights, and thus to visualize new possibilities and choices. The symbolic-analytic mind is trained to be skeptical, curious, and creative. (p. 230)

Learning to Collaborate and Communicate

... in America’s best classrooms ... the emphasis has shifted. Instead of individual achievement and competition, the focus is on group learning. Students learn to articulate, clarify, and then restate for one another how they identify and find answers. They learn how to seek and accept criticism from peers, solicit help, and give credit to others. They also learn to negotiate — to explain their own needs, to discern what others need and view things from others’ perspectives. (p. 233)

How many critical thinkers (symbolic analysts) will we have the foresight to develop? For each student we fail to reach, we create an economic dependent; for each student we help to possess the requisite abilities and traits, we create a producer who can carry not only himself or herself, but those dependents inevitable in any society. How urgent do we perceive the problem to be? How clearly do we understand the problem and its dimensions?

The Vision of Lester Thurow: Two Forms of Capitalism at War in a World of Economic Revolutions

The world that Lester Thurow looks out upon is a world of multiple revolutions: a green revolution, a materials-science revolution, a telecommunications-computer-transportation-logistics revolution. These revolutions require fundamental changes in all economies around the world. We live in a multi-polar world: the global economy is no longer pivoting solely around the United States as it did in the fifties and sixties.

As Thurow sees it, “Nowhere are the necessary changes going to be harder to make than in the United States, for in the past century it has been the most successful economy in the world.” (Head to Head, p. 16) Our tendency, Thurow believes, will be to continue the strategies that brought us success in the past, even though those strategies no longer fit a “multi-polar” world.

For example, military power is now a distinct disadvantage rather than an advantage, a drain on the national treasury and a limitation on investments necessary for competition. Here are the new questions that in Thurow’s view can be used to measure world economic strength.

Who can make the best products? What expands their standards of living most rapidly? Who has the best-educated and best-skilled work force in the world? Who is the world’s leader in investment — plant and equipment, research and development, infrastructure? Who organizes best? Whose institutions — government, education, business — are world leaders in efficiency? (pp. 23–24)

Much of Thurow’s argument is based on a distinction between the two forms of capitalism currently in competition for world leadership: communitarian and individualistic capitalism. In every way, Thurow argues, it is clear that communitarian capitalism (such as in Germany and Japan) wins out over individualistic capitalism (such as in U.S. and Great Britain). This is reflected in many statistics including those of the World Economic Forum relating to American, German, and Japanese management (p. 162). Thurow sums up the problem as follows:

Japan and Germany, the countries that are outperforming America in international trade, do not have less government or more motivated individuals. They are countries noted for their careful organization of teams — teams that involve workers and managers, teams that involve suppliers and customers, teams that involve government and business.... But American mythology extols only the individual — the Lone Ranger

or Rambo.... History is littered with the wrecks of countries whose mythologies were more important than reality. (p. 298)

In essence, Thurow's analysis calls for a transformed American global view in which we recognize the obsolescence of some of our most fundamental traditional assumptions and the need to shift our world-view — to make no less than a fundamental intellectual paradigm shift.

But isn't this asking a lot of a nation that has never put a premium on the ability to think critically? Isn't this asking a lot of a nation that historically has been able to solve its problems with sheer hard work and physical courage? Isn't this asking a lot of a nation that believes deeply in the tried and true, that has been conditioned to think of itself as leading not following and as being the most progressive, as being always number one?

Thurow nowhere discusses how this shift is to occur, how the electorate is to be persuaded into such a radical re-orientation. We tend to seek security in the familiar, in the established, in the traditional: if we don't find it immediately, we look harder, but in the same places! Since most Americans have not been prepared by their education to do the requisite critical thinking that would support a paradigm shift such as Thurow suggests, how are they to do it?

If Thurow is right in his analysis of world economic conditions, then it will not be sufficient for a small minority of highly paid workers to learn to think critically as "symbolic analysts." It will not be enough for a few to be comfortable with abstractions, to be able to think in terms of alternative systems, to test ideas for their strengths, and to recognize the value of collaboration. But here, again, is the most pressing problem of the day: How are we to persuade educators, how are we to persuade citizens, how are we to persuade parents that a new economic era is dawning? How are we to persuade the general public, which itself has not learned to think critically, that it is now in our collective national interest to set as our first priority the development of critical thinking abilities and traits in all of our children?

The Vision of W. Edwards Deming: Everyone a Critical Thinker Contributing to Continuous Improvement

W. Edwards Deming, the American marvel who, after WWII, designed the highly successful Japanese style of management and production, built his whole approach on the assumption that the most important asset of any company is the capacity of the individuals in it to use their ability to think critically to improve their collective performance. Success can be found, in his view, in the ability to devise structures that systematically encourage and reward the critique and improvement of process. He

therefore established a system of interrelated networks of “workers and managers” (quality control circles, so called) who use “critical reflection in a formal but unthreatening setting so as to establish what it is good to do.” (Holt, p. 383) When procedures are designed to bring the maximum degree of constructive critical thinking to bear on the problems of production, virtually everyone has a potential contribution to make. The quality of the contribution will not be a function of the worker’s position in the hierarchy, but the quality of the critical thinking he or she brings to bear on the problem. This, again, requires the paradigm shift that American businesses seem reluctant to make.

Unfortunately, though Deming is now popular and much has been written about the Deming way and “total quality management,” most writings emphasize the “techniques” and “procedures” of Deming while leaving out the critical thinking they require to succeed. They have tried to “formalize” Deming, to reduce Deming to a series of procedures and charts. The inevitable result is a caricature of Deming: Total Quality Control without the “quality.” Only excellence in thinking can produce genuine, continuous improvement in quality, and excellence in thinking cannot be produced with simplistic procedures and slogans.

But we are still captive of a traditional American assumption that might be expressed as follows: “Every idea of importance can be expressed simply and learned easily. The true challenges of life are to be found in everyday hard work and extraordinary courage and neither of those require deep or ‘intellectual’ thinking.”

The necessary paradigm shifts, however, do entail the cultivation of critical thinking across the work force, up and down the lines of labor and management, across industries, across educational levels, and into the everyday discussions of national and international issues. This shift is painfully against the American grain, contrary to our traditional folk wisdom, and incompatible with much current thinking of both business and labor leaders.

The Vision of Robert Heilbroner: The Challenge of Large-Scale Disorder

Robert Heilbroner argues, as do Reich and Thurow, that though capitalism will be dominant in the 21st Century, there will be serious conflicts between opposing forms of capitalism. As a result of these conflicts, a new and perplexing dimension to the picture will emerge: the challenge of “macro-disorder,” of economy-wide and world-wide problems arising from the market mechanism following its own logic without making critical adjustments. This problem calls for solutions we have yet to think through. He calls this problem that of negative “externalities,” of market failures that have large-scale, and to date uncontrolled, negative consequences.

Addressing these large-scale problems requires a new brand of both leadership and followership. We need leaders who become comfortable talking about and thinking through complexities. We need “followers” with the thoughtful ability and patience to grasp the very complexities being explained. Here are some of the large-scale problems that Heilbroner has in mind:

The overcutting of forests, the overfishing of the seas, the over-consumption of gasoline . . . the indeterminacy of the outlook for investment and for technology; the unequal distribution of incomes; the volatility of credit; the tendency towards monopoly; over-regulation; the technological displacement of labor and the technological impetus towards cartelization; the inflationary tendencies of a successful economy and the depressive tendencies of an unsuccessful one; the vacillation between optimism and pessimism . . . the approach of ecological barriers . . . the internationalizing tendency of capital that continues to outpace the defensive powers of individual governments. (p. 104)

He summarizes our situation as follows:

... the problems of capitalist disorder — too many to recite, too complex in their origins to take up one at a time . . . arise from the workings of the system . . . The problems must be addressed by the assertion of political will . . . the undesired dynamics of the economic sphere must be contained, redressed, or redirected by the only agency capable of asserting a counter-force to that of the economic sphere. It is the government. (pp. 108–109)

The unanswered questions are, “Who or what is going to direct governments to make rational decisions in the long-term public interest? Where are we to turn to find this new kind of leader? How are we to cultivate the new kind of electorate?”

If the electorates in the various countries do not learn to think critically about large and vexing questions in the environment, in the economy, in health care and overpopulation, it is likely that government policies will be directed by small groups whose short-range interests easily triumph over long-range public good. We are facing basic problems in our capacity to govern ourselves. But all government is finally government made up of people, and people can rise only to the height of their own ability. The crucial issue is, “Will we develop the thinking abilities and intellectual traits of our citizens to a level that will be sufficient for survival?”

The Challenge of the Future

The world of the 21st Century — virtually all commentators agree — will see intensifying economic competition between forms of capitalism. Governmental, economic, social, and environmental problems will become increasingly complex and interdependent. Basic causes will be both global and national. The forces to be understood and controlled will be corporate, national, trans-national, cultural, religious, economic, and environmental, all intricately intertwined. Critical thinking will become a survival need, an external imperative for every nation and for every individual who must survive on his or her own talents, abilities, and traits.

A battle for economic vitality is being fought. Yet consider how unprepared we have been, and continue to be, for that battle. Consider the size of our national debt, the decay of our infrastructure. Consider the intensification of social divisions and

divisiveness, the obsolescence of our systems of public education. Consider our traditional but increasingly dangerous assumption that the solutions to our problems lie in a dependence on traditional wisdom. Consider our traditional anti-intellectualism, our traditional parochialism. Can we free ourselves from our own narrow modes of thinking?

Can we accept the fact of accelerating change and complexity? Can we develop intellectual humility and flexibility? Can we develop faith in reason as a tool of discovery? Can we learn to think within points of view other than our own? Can we accept that we are no longer the dominant economic force in the world? Can we learn to think in the long-term and not simply in terms of short-term advantages? Can we begin to make decisions that are in the long-range interest of our children and their well-being? Can we become habitual thinkers rather than reactors and learn to continually inform our action with deep thought? These are the challenges we face. How we respond to them will determine our national fate.

Implications

What, then, do we need to do?

As a society, our challenge is to recognize that the work of the future is the work of the mind, intellectual work, work that involves reasoning and intellectual self-discipline. Our challenge is to demonstrate intellectual courage in facing our traditional indifference to the development of our minds, our traditional arrogance in assuming that our common sense will always provide the answers, and that our example will always lead the world. We are unaccustomed to this kind of challenge.

We are uncomfortable with things intellectual. The very word smacks of subversive, egghead, ivory tower, out of touch, impractical, unrealistic. Our collective mindset is now working against us and we must own that fact. We need to “discover,” and then genuinely explore in depth this whole notion of substantive critical thinking, of thinking based on intellectual discipline and standards. We need to transform our schools, our businesses, and our lives accordingly. Are we willing to evaluate our own thinking? Are we willing to set ideology aside? Are we willing to re-think our most basic thinking?

To date, we are still under the sway of the misconception that thinking more or less “takes care of itself,” that simply by studying “hard” subjects or “concentrating” we can think well. In general, we still treat knowledge as something that can be given to us and inserted into our minds by memory alone. We must begin now to set ourselves a course that will take many, many years to reach.

1) We must parent differently. We must respond differently to our children’s “Why?” questions. We must not give them short didactic answers, but must encourage them to conjecture as to the answers. We must call more attention to the extent of our

own ignorance and not try to convince our children that adults have good answers for most of their questions.

We must dialogue more with our children about complexities in their lives and in ours. We must help them to discover their own capacity to figure things out, to reason through situations. We must hold them responsible to think and not simply to rotely respond. We must step more into their points of view and help them to step more into the points of view of others. We must help them to identify their own assumptions, clarify their emerging concepts, question their habitual inferences. We must raise our children so that critical thinking becomes an integral part of their everyday lives. They must learn to accept its responsibility and come to discover its power and challenge.

2) We must work differently. We must bring the reality of cooperative critical thinking into the workplace in a thorough way. This means that we must abandon quick-fix strategies and recognize the counterfeits of substantial change. We must become aware of the difference, for example, between the jargon of “Total Quality Management” (which we now have in abundance) and the reality (which we almost entirely lack).

Both managers and workers need to learn how to begin to think in a new way: we must learn how to discipline our thinking to a new level of clarity, precision, relevance, depth, and coherence. CEO’s need to learn how to think within alternative models of how to organize and run businesses. Leaders in industry need to learn to broaden their perspectives and think about the long-range interests of the economy and not simply about short-range, vested interests of their businesses. Labor leaders need to concentrate more on support for programs that cultivate broad-based job skills and abilities, that emphasize the basic thinking skills of workers, and less on immediate bread and butter issues.

We must each take it upon ourselves to become lifelong learners, searching for ways to continuously upgrade our reasoning skills, our critical reading skills, our ability and propensity to enter into the points of view of others. Complex problems have many facets, and intellectual humility requires that we become used to exploring multiple perspectives before we make a decision. No more “Ready!... Fire!... Aim!”

3) We must educate differently. We can no longer afford the high cost of educators who have few or no critical thinking skills, and little or no motivation to develop them. Teachers and administrators who do not themselves think critically, cannot design changes in curriculum and instruction that foster critical thinking. We must come to terms with the most fundamental problem in education today and that is “the blind leading the blind.” Many educators do not realize that they are functionally blind to the demands of our post-industrial world.

As CEO and Chairman of Apple Computer, John Sculley, Has Put It

In the new economy, strategic resources no longer just come out of the ground. The strategic resources are ideas and information that come out of our minds.

The result: as a nation, we have gone from being resource-rich in the old economy to resource-poor in the new economy almost overnight! Our public education has not successfully made the shift from teaching the memorization of facts to achieving the learning of critical thinking skills. We are still trapped in a K–12 public education system which is preparing our youth for jobs that no longer exist.

Is There Room for Any Optimism?

Yet there is room for optimism, but only under certain conditions. We have the theoretical foundation and expertise to bring critical thinking to our children, but do we have the vision and the will? If we do, we have an ace in the hole. What Deming did not anticipate was the opportunity of systematically enhancing the critical thinking of the workers as well as the students in our schools, and the competitive advantage that this would provide.

Those countries with the foresight to systematically cultivate the critical thinking of their citizens of all ages, through the educational systems in schools and the workplace, will enjoy a significant competitive advantage over countries that do not make this effort. This is particularly true when this foresight extends to emphasizing high-quality, Deming-style production models. At present, no country in the world systematically fosters critical thinking. Opportunities await those nations who can see the potential to invest intensely in this specific effort.

What we can be sure of is that the persuasiveness of the argument for critical thinking will only grow year by year, day by day — for the logic of the argument is simply the only prudent response to the accelerating change, to the increasing complexity of our world. No gimmick, no crafty substitute, can be found for the cultivation of quality thinking. The quality of our lives can only become more and more obviously the product of the quality of the thinking we use to create them.

Critical thinking is ancient, but until now its practice was for the elite minority, for the few. But the few, in possession of superior power of disciplined thought, used it as one might only expect, to advance the interests of the few. We can never expect the few to become the long-term benevolent caretakers of the many.

The many must become privy to the superior intellectual abilities, discipline, and traits of the traditional privileged few. Progressively, the power and accessibility of critical thinking will become more and more apparent to more and more people, particularly to those who have had limited access to the educational opportunities available to the fortunate few.

The only question is how long and how painful the process will be and what we shall sacrifice of the public good in the meanwhile. How many of our citizens will live lives unemployed and unemployable in the post-industrial age?

We must sooner or later abandon the traditional attempt to teach our fellow citizens what to think. Such efforts cannot prepare us for the real world we must, in fact, face. We must concentrate instead on teaching ourselves how to think, thus freeing us to think for ourselves, critically, fairmindedly, and deeply. We have no choice, not in the long haul, not in the face of the irrepressible logic of accelerating change and increasing complexity.

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