A New Way of Thinking: The Challenge of the Future

We must change the way we view the world before we can find the best ways to prepare students for the future.

The greatest challenge facing education is not technology, not resources, not accountability—it is the need to discover with our students a new way of thinking. This quest does not require merely different information but rather a whole new way of viewing the world. In this article I suggest that new directions emerging from the philosophy of science can help students redefine their world.

Obsolete Models

Science is forcing us to change our view of the world. As Alfred North Whitehead has written, "The old foundations of scientific thought are becoming unintelligible. Time, space, matter, structure, pattern, function, etc.—all require reinterpretation" (Harris 1983). Thomas Kuhn (1957) explains that "for half a century we have been in the midst of a... conceptual revolution that is once again changing the scientist's conception of space, matter, force, and the structure of the universe." Peter Drucker (1969) writes, "The fact that we are shifting from a Cartesian view of the universe, in which the accent has been on parts and elements, to a configuration view, with emphasis on wholes and patterns, challenges every single dividing line between areas of study and knowledge."

Because of these upheavals in thought, the conceptual models of the world that our culture uses are no longer consistent with scientific knowledge. As a result, these models are becoming less and less effective in explaining our world to us. The Cartesian-Newtonian world of order, linear sequence, and mechanistic prediction, for example, is valid only in limited contexts. Paul Davies writes that since the time of Isaac Newton we have visualized our world either as a sterile machine or in a state of entropy or decay. He examines a new paradigm, or worldview, that reflects a more integrative point of view: "the collective, cooperative, and organizational aspects of nature..." (Davies 1988).

Implications

What causes these shifts in thinking in a culture? They occur when our understandings of the world become inconsistent with emerging descriptions of reality. In science this happens when new empirical data disprove an established framework or when new theoretical propositions become accepted. As these changes in scientific thought filter through society, many beliefs and values change. Consider, for example, the far-reaching implications of abandoning the belief that the earth was the center of the universe. Because changes in scientific thought affect all of society, they have implications for education as well. New knowledge continually challenges accepted educational beliefs. For example, how many educators really believe, based on their experience and observation, that a person learns to read by sequentially mastering 80 to 125 skills in a reading continuum? How many educators maintain that effective teaching is merely the summation of five or seven sets of behaviors organized ideally in linear order? Does anyone actually believe that tests measure what we know? Is knowledge really confined to separate, distinct subjects that rarely relate to experiential reality? Clearly, the inadequacies of the Cartesian-Newtonian worldview make themselves apparent in education as well as in science.

A Dynamic Unity

One of our obsolete conceptions is the way we fragment reality. New developments in virtually every field of science, as well as in the social sciences, suggest that "the universe is not
a mechanical multiplicity of things. It is a single, dynamic unity" (Lucas 1985). Yet most of our assumptions about the nature of reality require us to reduce things into discrete parts, to see ourselves as separate from other people, from other things, from our environment.

The more ways we tell students that the universe is made up of independent fragments, the more their minds will conceptualize and reproduce such a world. Much of our curriculum and many of our instructional practices, for example, suggest to students that "the one who thinks is at least in principle completely separate from and independent of the reality that he thinks about . . . " (Bohm 1980). We have separate subjects, separate skills, separate objectives, separate evaluations, segmented continuums, linear methods, behavioral techniques, and isolated classrooms. These practices are not necessarily wrong, but they are based on assumptions that apply less and less to the new understandings we have of the world. Moreover, they convey to students a world of knowledge unrelated to meaning and a world in which outcome is independent of process.

Content and Process

The question "What should our students know in the future?" embraces both content and process. We have usually viewed these as separate topics, and in some cases that is useful. Content has been characterized as "information" and process as "method." These distinctions become less useful, however, within the context of our new paradigm.

Regarding content, the emphasis now is on its significance, the questions behind the information, the structural aspects of disciplines, and how specific content in one field relates to specific content in another. Process, on the other hand, is not just method; it is learning how to manipulate content in order to extend its relationships. It is an exploration of the ways we learn and internalize content and how we might apply these to produce meaningful understandings of ourselves and our world. Hence, content and process are being reconceptualized. They stand in relation to each other, and each is embedded in the other.

Complexity and Chaos

There is a growing recognition that our world is complex—indeed, chaotic. When I ask students to describe the world they live in, they use words like complex, dynamic, hectic, stressful, fast-paced, and chaotic. Many scientists and researchers use similar language: random, interactive, dynamic, and synergetic. The Nobel-prize-winning chemist Ilya Prigogine titled one of his books Order Out of Chaos (Prigogine and Stengers 1984). Donald Schon (1984) describes today's managers as "managers of chaos."

Yet, in spite of the multitude of seemingly random interactions that occur in our world, there are both purposefulness and unity that sometimes seem to defy explanation. This is true whether we consider subatomic physics or the astronomer's understanding of the cosmos. We humans are not separate from this unity, but instead are part of it. Metaphorically speaking, we can no longer perceive ourselves as independent observers standing beside a rushing stream, noting its twists and turns, studying it objectively. Nor can we conceptualize the stream as merely something to be navigated from point A to point B. We must add a new relationship to the stream—we are the stream (Janisch 1975). Hence, objectivity and subjectivity merge to create an approach that embraces the unity of both.

Compatible Educational Practices

You may have begun to wonder what this has to do with teaching and learning. Let me suggest some developments that reflect aspects of the underlying assumptions behind these changes in thought.

Cooperative learning. This educational practice has received widespread attention in recent years. In small groups, students learn content cooperatively and collectively. Although group learning is not new to education, the emphasis here is on the "cooperative" aspects of the process. Each student becomes responsible not only for his or her own learning, but also for that of each member of the group. Roles are rotated to ensure that students participate actively. Outcomes are often judged collectively rather than individually. The "success" of the group depends on how it functioned as well as on the performance outcome. There is clear emphasis on student interaction and the experiential lessons in learning together. [See Johnson et al. (1984) and Slavin (1983) for more information about this approach.]

Cooperative learning fosters connections among learners and emphasizes the role of nonlinear interaction in solving problems and completing assignments. The emotional significance of being a valued member of a group is thus related to the learning process. Content, here, is viewed not only as information but as the experience of cooperation itself.

Complex instruction. This variation of cooperative grouping emphasizes both barriers to achievement and the teacher's role in the management process. Groups are arranged to work through discovery activities, with both individual and group outcomes expected. Roles are assigned to each member and cooperative interaction is encouraged. There is greater emphasis on the content of the lesson in this approach, however, than is typical in cooperative learning.

As many as six groups explore different activities that relate to various aspects of the same concept; for example, sound. Each day the lesson in-
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Whole language. This approach to language and literacy rejects the common separation of language processes into reading, writing, speaking, and listening. Instead, language is viewed as a totality that is an integral part of our experience and a natural means of expression. Literature, art, music, and drama become important ways to encourage this expression. The process of writing is taught. Students become authors of their own books. Mistakes are viewed as valuable sources of information for helping students achieve greater overall literacy. Classrooms become rich in stimuli and language production. Meaning and experience are emphasized as children are immersed in the process of becoming "meaning makers."

Whole language is an excellent example of many new paradigmatic concepts. The concepts of integration, complexity, and holism are central to this approach. Process and content are intertwined, as are the student and learning.

Brain-based learning. This approach includes a number of techniques based on new understandings of how the brain works. Research in the neurosciences has contributed greatly to this new knowledge. Caine and Caine (1989) have summarized important principles of brain-based approaches that help define the possibilities for learning theory.

- Although we may focus on one thing at a time, the brain processes and organizes many things at the same time.
- Learning is a physiological experience and much more than just a mental exercise.
  - The brain organizes new knowledge on the basis of previous experience and meaning.
  - Patterns of experience help determine the significance of content.
  - The relationship between one's emotional state and learning is critical.
  - The brain processes parts and wholes simultaneously.
  - Peripheral stimuli are processed by the brain both consciously and unconsciously.
  - We have a spatial memory system that retrieves experience quickly and easily. Spatial memory allows us to recall holistic images. Take, for example, last night's dinner. Although we made no attempt to memorize the particular foods, our memory of the experience is intact and perhaps rather detailed.
  - Facts and skills that are not embedded in spatial memory need more practice and rehearsal.
  - The brain responds to challenges but is less effective when threatened.
  - These principles are closely compatible with our new way of conceptualizing the world: complexity, interrelatedness, unity, and emergence.

Other Challenges
If we are to succeed in creating a new way of thinking, the focus must go beyond teaching practices. The structure of the school will be profoundly affected. The "school" cannot separate itself from learning. It is not merely a place or an organization; the school is teaching and learning.

Instead of being institutions for learning, how can schools become learning institutions? Our new worldview suggests that isolation cannot lead to meaningful learning within any organization. But schools isolate kids from experience. Teachers are isolated in classrooms. Principals are isolated from students, teachers, and other principals. Staff evaluation is isolated from professional growth. Schools are isolated from each other. Subject matter is often separate and thus isolated. And skill development is almost always isolated. We must ask, "How can the school and all its constituent parts become more integrated, more cohesive?"

Another challenge to our thinking will be in curriculum. Through interdisciplinary studies we begin to see how each discipline informs and extends the others. Whether we pursue integrative teaching, thematic teaching, interdisciplinary or transdisciplinary teaching, we must convey the significant meanings embedded in or across content and activities. When we see relationships and patterns, isolation diminishes and integration becomes meaningful. Themes are useful organizers when they help us examine the basic unity of many of our concepts. The study of macro-phenomena such as war and peace, ecological issues, or political dilemmas can benefit most by transdisciplinary studies when we aim for nonreductionist, imaginative thinking.

Guiding Metaphors
One of the difficulties a culture has when it creates new ways of thinking is the development of apt metaphors to assist in making a transition. Metaphors, however, are not explanations; they are merely guides that provide "comfort zones" so our thinking may expand. What metaphors might help us deal with these abstract concepts on a day-to-day basis?

For me, the concept of "embeddedness" is a useful metaphor. For example, embedded in teaching is learning; the two cannot really be talked about separately. Embedded in the teacher is the student, for one is incomplete without the other. Embedded in history is art, science, literature, and music. Embedded in humans is nature; we are part of our environment, and it is part of us. Embedded in work is play.
Opposites and dualisms become insignificant, seen in this metaphorical light. Paradoxes that were once not allowed because they were illogical (according to Western logic) are now to be explored. For example, we once thought that light must be either a particle or a wave. Logic would not permit it to be both. Yet we have since found that light is indeed both a particle and a wave. That we are embedded in people, things, organizations, curriculum, and instructional processes is not easy to fathom, but it does express the essence of the emerging worldview.

Another cogent metaphor is viewing education as art. While this metaphor is nothing new, I have chosen it for perhaps different reasons than others. Embedded in art is technique, imagination, philosophy, function, perspective, variability, experimentation, awareness, and the "inner eye" of the artist. The range of media is open as are the combinations of media. Mastery can occur at many different levels. Past, present, and future are intertwined. Process and product are merged, never really independent of each other. Art is social and political as well as aesthetic; it relates significantly to human experience. Art stretches us to reinterpret and continuously recreate the world. As a metaphor for education, art has the potential of helping us create—and realize—a new vision for our schools.

A Word About the Future
One of the most sensible explanations of the future that I have seen comes from Constantinos Doxiadis (1974). He viewed the future from four perspectives: (1) the constant past—such as mountains, rivers, oceans, continents—that will remain as part of our foreseeable future; (2) the declining past—such as institutions, buildings, traditions, values, ideas, even people; things that may be in a state of decline but will continue to influence and affect our lives; (3) the continuing past—which includes each of us and our children, as well as the structures, ideas, and values that have been learned from the past yet adopted for the future; (4) the created future—the spontaneous acts of creativity that provide shape and direction for the world to come. The future, in other words, is rooted in the past yet is open to imagination and creative initiative.

As we help students explore their future, we will inevitably explore our own. We need to appreciate where we are and how we got here. The challenge of a new way of thinking is not a call to abandon cherished values that have provided meaning and direction. Rather it is a challenge to participate in creating a new vision of our role as humans and in educating students to achieve that potential.

References

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