Concepts as Organizing Frameworks

Edward T. Clark, Jr.

Concepts provide a powerful conceptual framework that ultimately encompasses all disciplines and knowledge.

The mind thinks with ideas, not with information.... The principal task of education, therefore, is to teach young minds how to deal with ideas: how to evaluate them, extend them, adapt them to new uses. This can be done with the use of very little information, perhaps none at all.... An excess of information may actually crowd out ideas, leaving the mind (young minds especially) distracted by sterile, disconnected facts, lost among shapeless heaps of data. (Roszak 1994)

The learning process requires that new information become part of a coherent conceptual structure, yet no systematic attempt is being made to create a curriculum which reflects that requirement. (Marion Brady 1989)

In previous articles I have discussed the relationship between systems thinking, the structure of knowledge, and the fact that humans construct rather than discover knowledge. In this article I want to explore in greater detail the central function that concepts play in understanding and constructing knowledge. Although I have been using the terms “principle” and “concept” interchangeably, here I will use the term “concepts,” since this is a term used extensively in education. Although there are many broad concepts that are discipline-specific, the concepts to which I will be referring are those universal, systemic principles that are implicit if not explicit in every academic discipline: interdependence, diversity, structure/function. Because these concepts can be applied in meaningful ways to every field of study, they suggest the interdependent nature of all forms of knowledge and provide powerful cognitive tools with which to bridge the chasms that exist between the various disciplines.

My working definition of “concept” is a big idea that helps us makes sense of, or connect, lots of little ideas. Concepts are like cognitive file folders. They provide us with a framework or structure within which we can file an almost limitless amount of in-

EDWARD T. CLARK, JR., was an educational consultant who specialized in integrated curriculum design and site-based educational change. He had been involved in teacher education for over 30 years, as Director of Teacher Education at Webster University, as Professor of Environmental Education at George Williams College, and as an independent educational consultant.

Ed passed away in the summer of 2010, and as a tribute to him and his unique contributions to this Journal over the years, Encounter is proud to republish, in quarterly chapter-length installments, his entire book, Designing and Implementing an Integrated Curriculum: A Student-Centered Approach.
formation. One of the unique features of these conceptual files is their capacity for cross-referencing. Because concepts focus on similarities and homologies, they provide powerful linkages between what would otherwise be considered disparate and seemingly incompatible information. For example, think of how many “little ideas” from almost every field of knowledge can be linked together under the concept, “hot.” Once a child learns experientially what “hot” means, she can make an almost infinite number of connections and associations without having to be burned again.

Because of these amazing capacities of association, concepts are the primary cognitive information organizing strategies, and, as such, are the most powerful and therefore most useful cognitive tools available to us. Most of us are completely unaware of how we use concepts. Symington and Novak (1982) remind us, “It is through the concepts we form, and the linkages we make between them, that we make sense of the world around us.” Theodore Roszak (1994) echoes this when he writes, “The mind thinks with ideas [or concepts], not with information [or facts].”

Bruner (1960) was referring to concepts when he discussed the role of structure in thinking and learning. He identified four essential functions that concepts perform in helping us organize our perceptions and understanding of the world.

1. **Concepts provide structure for a discipline.** In every academic discipline there are a set of fundamental concepts and principles that constitute the conceptual structure of the discipline. Earlier I compared such concepts to the studs that frame a house. While studs do not provide detailed information about either the rooms or the house, they do furnish an overview of the shape, size, and layout of the rooms and a structural schema of the entire house. In like manner, while concepts don’t provide information about the details of a subject, they do make it possible to understand the relationships that exist within that discipline and how it functions as an integrated knowledge system. Based on the importance of understanding this structure, the National Center for Improving Science Education has proposed a set of conceptual themes for organizing science curriculum: “cause and effect, change and conservation, diversity and variation, energy and matter, evolution and equilibrium, models and theories, probability and prediction, structure and function, systems and interaction, and time and scale” (Brooks and Brooks 1993). Although these concepts represent fundamental scientific processes, from a systems perspective, they can be applied to other subjects as well.

Once a learner has grasped these relationships, she has a context for asking appropriate questions to find whatever information is required for a given task. In an age where we are swamped by information overload, to understand the conceptual structure of a subject is to literally know more with less information. This is why, to paraphrase the Chinese proverb, “a concept is worth a thousand — or perhaps ten thousand — facts.” What an energy and time saver!

2. **Concepts provide a framework within which details can be more readily understood and remembered.** The conceptual framework of a subject is a natural, built-in mnemonic. Once grasped, this structure provides a context-of-meaning for learning detailed information in the form of facts and data. Because what is being learned can be associated with what is already known, it becomes meaningful (i.e., “full of meaning”) and can be remembered with relative ease. Gurley (1982) has demonstrated the degree to which concepts aid learning. In a ninth grade introductory biology class, concepts and concept mapping were introduced as a structure for learning more detailed information (Figure 6-1). On a test administered a year later, the retention rate of the experimental group was 80% higher than the control group, which had been taught using the conventional method — beginning with facts independent of any conceptual framework.

3. **Concepts are the primary bridges which make transfer of learning possible.** The transfer of learning is one of the most misunderstood concepts in education. Far from being a “science” that can be taught, as David Perkins and Gavriel Salomon (1992) suggest, the transfer of learning is an innate, intuitive capacity that is as natural as thinking and learning. Indeed, from what we now know about how thinking and learning take place, it seems clear that transfer is an integral feature of the cognitive process I have called intelligence/thinking/learning. The primary reason that so many adults are unable to transfer what has
been learned in one situation to a different situation is because they have been programmed to think linearly, inductively, and in little boxes.

Hilda Taba points out that each academic discipline has its own array of distinctive facts that have little or no meaning within other fields of study. As long as learning focuses on these “facts as building blocks,” no transfer of learning is possible because there are no natural bridges between the disciplines. As Taba’s taxonomy of knowledge makes clear, the key to the transfer of learning is a conceptual framework that bridges the various disciplines and shows how things are related to each other. Since there are a number of fundamental concepts that all disciplines share, these concepts can provide the necessary nexus between disciplines. For example, once a student learns the intrinsic relationship between structure and function, that insight can be applied in any arena, e.g., art, music, math, science, social studies, and language. In the same way, the other concepts identified by the National Center for Improving Science Education for organizing science curriculum — e.g., cause and effect, change and conservation, diversity and variation, energy and matter — are universally relevant. Once they are learned in science, they can be applied with meaning in virtually any subject.

Thompson School eighth grade team leader Doug Thompson notes that although members of the team were still teaching their own individual subjects, “The major strength for kids this year is that we are all talking about the same questions and concepts.”

A second grade teacher found that her students quickly understood, with no more than two or three examples, the ecological concept, adaptation. Once they learned this, there were able to make intuitive leaps — what educators call the transfer of learning — to discover examples of adaptation in other areas, e.g., humans adapt to cold weather by building houses. To return to an illustration used earlier, consider the transfer of learning implicit in the many ways we use a term like “hot.” Although few adults understand the physics of heat, we all know what is meant by “hot pants,” “hot stock,” “hot number,” “hot tip,” and “hot idea.” Even children — who presumably aren’t capable of abstract thinking — can generate a list of things that are or can be “hot.” In addition to the more obvious things, “hot stove,” “hot sun,” “hot water,” kids who have been raised on MTV may also talk about a “hot band” or a “hot song.” This is because children naturally see relationships and make connections, often far beyond the capacities of adults who have been programmed to think in little boxes.

Kathy Krug’s face glowed as she told us about how learning transfer occurred for one of her students. Warren had just finished reading a column from the Chicago Tribune in which columnist Bob Greene wrote about Michael Jordan’s daily early morning drives to the Chicago White Sox training facility. Talking about his father who had been murdered the previous year, Jordan told Greene, “I’m alone in the car, but my father is with me…. I remember why I’m doing this. I remember why I’m here. I’m here for him.” Jeremy’s eyes sparkled. “Ms. Krug, Michael Jordan was just like Rudy Matt in the

The Thompson Middle School, located in St. Charles, IL, was the site of one of the most ambitious applications of Clark’s Integrated Curriculum. Many of the commentaries appearing in this article are from teachers and administrators at the school.
story, *Banner In The Sky* by Ramsey Ullman, we read last month, wasn’t he!"

4. **Concepts provide the framework for lifelong learning.** Twenty-five years ago Bruner suggested that concepts were the foundation for lifelong learning. With the focus today on preparing students to be lifelong learners, it is crucial for teachers to understand that one of the first steps toward achieving this outcome must be a recognition of the fundamental role that concepts play in thinking and learning. Concepts help us make sense of our world precisely because they are the vehicles that carry most of the information necessary for thinking and learning. To attempt to teach someone to think or learn without using concepts as a framework is like trying to teach them how to paddle without providing them with a canoe. Another, perhaps more accurate analogy is that concepts are like railroad tracks. Teaching facts without first understanding concepts is like trying to drive a locomotive without first laying out the tracks.

5. **Concepts provide the cognitive framework that makes it possible for us to construct our own understandings of the world in which we live** (Brooks and Brooks 1993). As has already been noted, whenever we learn something we place it into some framework that we already understand. In so doing, we create our own interpretation and meaning. Indeed, learning is the act of interpretation that emerges from the interaction between the learner and the object of learning. As C. T. Fosnot notes, “Learning is not discovering more, but interpreting through a different scheme or structure” (Brooks and Brooks 1993). In short, learning is “meaning-making” and requires a context (a cognitive structure) to occur. In order to aid and abet our natural capacity for constructing knowledge, the Brookses propose that teachers structure curriculum around primary concepts and “conceptual clusters of problems, questions, and discrepant situations.”

**Concepts and the Theory of Living Systems**

Of immense importance in becoming a lifelong learner is an understanding of what are generally known as systems principles — broad concepts that, according to the theory of living systems, are universally applicable. Because these concepts apply to all fields of knowledge, they provide us with a single conceptual framework for thinking and learning and with a virtually unlimited number of cognitive bridges for the transfer of learning. To return to the railroad analogy, one set of tracks can carry trains of belonging to any railroad company.

According to physicist Fritjof Capra (1994),

The theory of living systems looks at the world in terms of relationships and integration. It recognizes that all life on earth is organized in an intricate web of inter-relationships. Far from being random, these relationships seem to be arranged in a series of complex, interconnecting patterns which we call living systems. *Whether we are describing individual organisms, social systems or ecological systems, these patterns are consistent, reflecting at all levels common properties and similar principles of organization.* (emphasis added)

These principles of organization are the principles of ecology. Although we tend to think of ecology as the study of nature’s systems, the fact that human cultures are inextricably embedded in the these natural ecological systems, suggests that at some fundamental level, cultural systems are homologous — that is, “similar in structure and evolutionary origin” with natural systems. In short, cultural systems are ecological systems. As such, they may be considered subsystems of the planetary ecological system much the same way that the heart and lungs are subsystems of the human body. From this perspective, every academic discipline and professional field of work is ecological in character. For example,

- Sociology is the ecology of social groups.
- Political science is the ecology of collective decision-making.
- Economics is the ecology of finance and exchange.
- Anthropology is the ecology of culture.
- Business management is concerned with the ecology of organizations.
- Physics, chemistry, and geology are studies of the ecology of physical matter.
- Mathematics is the ecology of numbers and their relationship to physical matter.
Reading and writing are fundamental expressions of the ecology of language and communication while art, music, drama, and dance reflect other, more subtle forms of the ecology of communication.

According to the theory of living systems, these academic disciplines share common properties and certain principles of organization with all other living systems from the simplest cell or organism to the global village. These are the principles and properties found in ecological systems.

Operating Principles for Living Systems

While there are hundreds of principles and concepts that characterize ecological systems, the primary ones include interdependence, sustainability, diversity, partnership, coevolution, fluctuating cycles, and energy flow. (Parts of the following descriptions are taken from Capra, Clark, and Cooper [1994].)

Interdependence

Interdependence is the unifying principle operative in all systems. As the first principle of ecology, it defines the nature of the complex web of relationships that exist among the individual parts of a system and between those parts and the system as a whole. Substantively, it is a relationship in which the success of the system as a whole depends upon the success of each individual member, just as the success of each member depends upon the success of the whole system. In ecology, this relationship is illustrated best by the relationship that exists between an ecological community and the individual niches which make up that community. Each niche represents a functional slot in the ecology of a community. In a food chain, for example, each species often has a highly specialized function: providing food for a predator species and at the same time acting as predator for the species on which it feeds. If a particular species is wiped out by disease, the stability of the entire ecological community is, to some degree, diminished. In the same way, each business in a small town community fills a unique niche. Anytime one of these businesses fails and is not replaced, the stability of the community is, to some extent, diminished. In both ecological and human communities, the success of these niches — whether species or business — depends upon the success of the community as a whole, while the success of the entire community depends upon the success of each niche.

Interdependence is a universal characteristic recognized as being fundamental to the success of all social, economic, and political systems. As an integrative concept, it can be applied with equal appropriateness to a work of art and the study of a galaxy; to writing a sentence and learning a language; to computer science and the engineering of a spaceship; to the sociology of a family or of a multinational corporation; to economics, political science, or ecology. Because of its comprehensive relevance, interdependence can become a powerful unifying strand in the broad tapestry of thinking and learning. Once a child understands what interdependence means, he or she is able, through the transfer of learning, to operationalize the concept in a virtually limitless number of applications.

Sustainability

Every system requires a resource base to provide the raw materials upon which the system depends for survival. Because every system is finite, its resource base is necessarily limited. The long-term survival (sustainability) of any system depends on its ability to live within these limits. While there are tolerances, there is always a point of no return beyond which a system cannot extend itself and recover. For example, in a severe drought an ecological community may be pushed beyond its capacity to restore itself.

These limited resources define the system’s carrying capacity, i.e., its ability to sustain itself indefinitely on the given resources. A garden has a carrying capacity. So does a home, an office, a schoolroom, a business, a nation, and the planet. When the limits prescribed by available resources are exceeded, there is trouble. For example, just as an overcrowded garden is less productive, so crowding in an office inevitably cuts down on productivity. Crowding in a classroom always has negative consequences on learning. Crowding in our cities produces physical hazards — ranging from joblessness, homelessness, disease, and crime to more subtle psychological hazards, such as loneliness, stress,
depression, anger, frustration, and powerlessness. These conditions are symptomatic of system dis-equilibrium — “dis-ease.” While initially the symptoms may not be obvious, once they reach a critical mass, the result can be total systemic collapse, e.g., revolution.

**Diversity**

The successful maintenance and stability of any system depends substantially on the degree of complexity and diversity of its network of relationships. In general, greater diversity results in greater stability. For example, an oak forest with its rich diversity of life is far more stable than a cornfield, which is essentially a monoculture. A natural forest is more stable than a man-made forest of Douglas firs planted by a lumber company. Stability in cultural systems also requires diversity. The diversity of ethnic and cultural backgrounds is one of the strengths of our nation. In spite of our envy of Japan’s success, her major weakness is the lack of ethnic diversity. What appears to be strength may in time prove to be a fundamental weakness. It is ironic that both Japan and Germany, the two aggressor nations in World War II, were both in essence ethnic monocultures and highly susceptible to ideologies based on ethnic superiority. Such ideologies would have a harder time in the United States because if they appealed to one group (such as white supremacists), at the same time they would be rejected by many other groups. In all human organizations, diversity is necessary to maintain stability. This is especially important in our age of narrow specialization.

**Partnership**

All members of any living system are engaged in a subtle and dynamic interplay of competition and cooperation, involving countless forms of partnership strategies. These two powerful drives ideally function in a unique reciprocal relationship much like centrifugal and centripetal forces. When a dynamic balance between the two is achieved, the power and thrust of adaptive change results in both stability and creativity, each of which is crucial to the success of all living systems. When this balance is lost, the stability of the system is endangered. Too much competition leads to burnout and self-destruction. Too much cooperation leads to passivity, inertia, and apathy. The dynamic quality of this partnership principle is highlighted by the insight from chaos theory that creativity and novelty emerge at that elusive boundary between chaos and order (Briggs and Peat 1989).

Competition is one of the most misunderstood of all ecological concepts. It is a dogma of capitalistic society that unbridled competition is the fundamental driving principle in the natural world. Extrapolating from this interpretation of natural principles, there is a powerful bias in our country toward unrestrained competition in human economies, i.e., social Darwinism. The irony is that there is no such thing as unrestrained competition in nature, and no one believes in unrestrained economic competition. In natural systems, competition within species is always constrained by cooperative strategies such as territoriality and dominance hierarchy. Competition between species is controlled by factors such as adaptive modifications, which often result in two similar species utilizing entirely different food sources. In cultural systems, the most vocal defenders of unrestrained economic competition are often the first to exploit political means to protect themselves from the very competition that they defend.

In short, competition apart from cooperation is essentially a meaningless concept. Even in so-called competitive sports, successful competition requires some form of cooperative behavior. Indeed, one cannot conceive of a game without rules, whether it be the “game of life” as played in nature or the economic game as played in both capitalist democracies and communist dictatorships.

**Co-Evolution**

Change is a universal principle that reflects the impact of time on all systems. Systemic change occurs as species and groups coevolve through an interplay of creation and mutual adaptation. Ecosystems also coevolve with the larger systems of which they are a part. In each case, the creative selection of novelty in response to the changes in its environment is a fundamental property of life. This response is manifest in the process of change, growth, development, and learning and results in both creativity and increased diversity. The inability of a system to co-evolve eventually results in extinction — for a plant or animal species, for an indigenous culture,
for a business, for a national government, for the human species.

**Fluctuating Cycles**

The interdependencies among the members of a system involve the exchange of information, i.e., matter and energy, in continuous cycles. These cycles act as feedback loops that make possible the healthy, dynamic balance required by the system. These cycles have the tendency to maintain themselves in a flexible, fluctuating state as they provide various levels of tolerance in the dynamic interplay between stability and change.

There are two kinds of cycles in natural and cultural systems. One is the rhythmic fluctuations that occur over time, such as the seasons, life cycles, and economic cycles. The other refers to the physical recycling of materials — the flow and exchange of atoms and molecules of matter through physical systems, such as the planetary ecological system and the human body, and the flow of money as a symbolic substitute for materials that flow through cultural systems. Cycles in living systems are never static. Rather, as rhythms of change, they reflect the ongoing adaptive processes of a system. Because of their dynamic nature, their function in living systems can be described best in cybernetic terms as information feedback loops. Just as urinalysis provides information/feedback about the health of the human body, the quality of our planetary water supply provides us with information/feedback about the health of our ecological systems. Historian Arthur M. Schlesinger, Jr. (1986), has identified a cyclical rhythm in our national life that oscillates between public purpose and private interest. He suggests that true cycles are self-generating, driven by their own internal rhythms. Each phase flows naturally from the conditions of the previous phase, and in turn, creates the conditions that call forth the next recurrence. In a similar manner, cycles are relevant to every subject studied in school and every arena in life. For example, power utility companies design their systems to account for peak and nonpeak loads. In the same way, we can apply our knowledge of how growth/rest cycles shape ecological systems to cultural systems such as economic or organizational systems, to make them more efficient. For example, burnout reflects a failure to apply what we know about growth/rest cycles to human and organizational systems.

**Energy Flow**

All living systems are open systems and as such are dependent upon an external energy source for survival. Just as our planetary ecology is dependent upon the energy from the sun, all plants and animals are dependent upon an external energy source in the form of food. If we were able to think of food as energy, we would learn to be as careful about the food we take into our bodies as we are about the quality of gasoline we use in our automobiles. Cultural systems depend for their survival upon an external form of energy called information. Money, knowledge, and data are all forms of energy transformed into information — energy in-formation — by the human mind. Just as the health of natural systems depends upon a free flow of solar energy throughout the system, so the health of cultural systems requires a free flow of information, e.g., money, knowledge, and data, throughout the system. System imbalance occurs whenever there is a glut of energy/information, e.g., money, in one part of a system at the expense of the rest of the system. If this becomes too pronounced, a systemic embolism may result.

While these are the major organizing principles that characterize living systems, there are a number of related concepts such as those recommended for science education, which are also universally applicable. Table 6-1 identifies some that are particularly useful in educational settings.

<table>
<thead>
<tr>
<th>Ecological Principles</th>
<th>Related Concepts</th>
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<tbody>
<tr>
<td>Interdependence</td>
<td>Community/Niche, Network, System Models</td>
</tr>
<tr>
<td>Sustainability</td>
<td>Carrying Capacity, Habitat, Limits</td>
</tr>
<tr>
<td>Diversity</td>
<td>Similarities and Difference, Stability</td>
</tr>
<tr>
<td>Partnership</td>
<td>Cooperation/Competition, Structure/Function, Cause/Effect</td>
</tr>
<tr>
<td>Coevolution</td>
<td>Change, Adaptation, Succession, Values, Choice, Creativity</td>
</tr>
<tr>
<td>Energy Flow</td>
<td>Energy Exchange, Information Flow, Power</td>
</tr>
<tr>
<td>Fluctuating Cycles</td>
<td>Feedback, Cycles, Patterns, Balance, Permeable Boundaries, Tolerances</td>
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How Concepts Frame an Integrated Curriculum

Since all academic disciplines are in some elemental way ecological systems, these principles/concepts can be powerful cognitive organizers for framing an integrated curriculum that bridge all of the disciplines. Because, as Bruner notes, these concepts can be taught in some way to children of all ages, they can be used to integrate a curriculum vertically, that is across grade levels. This is what Bruner meant by a “spiral curriculum” — one in which certain basic concepts are revisited year after year, each time with new information and insight. This is a far more powerful and natural means of articulation than that found in conventional curricula with its linear, often arbitrary progression of ideas, subjects, and themes from the simplest to the more sophisticated. Figure 6-2 shows how the K–8 grade level curricula discussed earlier could be integrated vertically using the ecological concepts.

I will illustrate how some of these concepts might be used with the Focus or Contextual Questions in Chapter Five. Because of their ability to facilitate inquiry and learning, questions are useful for directing attention to specific concepts and their relevance to Focus or Contextual Questions. As might be expected, many of the questions apply equally well to several Focus Questions, e.g., families, neighborhoods, and communities.

Focus Question:
How Am I a Member of Many Families?

- What are the similarities and differences among the members of your family? What would it be like to live in a house where everyone was exactly alike? (Diversity, Tolerance, Variety) What are the different kinds of chores that the various members of your family perform? What happens when one of you doesn’t do his or her job? (Interdependence, Partnership, Niche)
- Draw a diagram or picture that shows how each member of your family depends on the others family members. (Interdependence, Patterns, Models)
- In what ways do you compete with others in your family? How do you cooperate with them? Which do you do most? What happens when you become too competitive? (Partnership, Diversity, Cause/Effect)
- What happens when a new baby is born into a family? (Co-creation, Diversity, Interdependence, Partnership).
- How many ways do you use to communicate with others? (Energy Flow, Information Flow, Feedback Cycles)
- How is your family different now than it was a year ago? Five years ago? What do you think it will be like when you are 10? Why? (Change, Diversity, Adaptation)
- What are the rules that determine how you spend your money? What would your family do with more money? With less money? (Sustainability, Limits)
- How would your life be different if you lived in your neighbor’s house instead of your own? If you lived in the next block, or a different city. (Habitat) How do you get along with your neighbors? How are your neighbors like you, and how are they different from you? (Community, Diversity)
Focus Question: What Is Culture?

- What kinds of resources does a neighborhood, town, city, and country need? How does its resources influence a town or a nation? What happens when a neighborhood, town, city, or country uses up all its resources? What can you know about a culture from its location? (Sustainability, Carrying Capacity, Habitat, Niche)
- How do people in a culture communicate with each other? (Energy Flow, Feedback Cycles, Information Flow, Patterns)
- How do cultures change over time? (Change, Stability, Diversity)
- Why are cultures different from each other? (Diversity, Adaptation, Change, Choice, Values) How do people in a culture compete with each other? How do they cooperate? (Partnership) Suppose all cultures were exactly alike? (Diversity, Partnership, Tolerance)
- How do the forms of transportation (or tools or food or shelter or technology) in a culture reflect the needs of the people? (Adaptation, Structure/Function, Creativity, Cause/Effect, Probability/Prediction)
- What kinds of rules do cultures need? (Limits) How are decisions made concerning rules? (Choice, Diversity, Cooperation/Competition)

Focus Question: What Does It Mean to be Human?

- In what ways is diversity built into our bodies? How are our bodies like systems? How are our minds like systems? How do the cells in our bodies compete/cooperate?
- How is my body like the Earth, like the Milky Way Galaxy, like a pond, like an earthworm?
- In what ways is my body a community or neighborhood?
- What kinds of energy does my body require to be healthy? What kinds of energy do I put into my body?
- How is language a feedback loop? How are my emotions a feedback loop? What kind of feedback do my various emotions give me? How are my thoughts a feedback loop? How can I learn from these feedback loops?
- How many different roles do I play each day? In what ways are these roles similar or different? Which is the real “me”?
- What kinds of limits/rules do I live by? What happens when I ignore these limits or break these rules? Which ones can I ignore without negative consequences?
- What cycles and patterns shape my life? What can I learn about myself from them?
- In what kinds of situations am I most creative, least creative?

Focus Question: How Does One Live Responsibly in the Global Community?

- What is the relationship between global resource distribution and national stability and global stability? What is meant by “bio-regionalism”? What would bio-regionalism do to local economies, to national economies, to global economies?
- What forms of communication are best suited to enhance global cooperation?
- What features do all cultures share? Which are distinctively different? What have we to learn from other cultures? What does our culture have to teach other cultures? Who decides which things are good and which things are bad about another culture? about your own culture? What is meant by “cultural hypnosis”?
- What is a reasonable standard of living for all humans based on the available resources? What changes would have to occur if everyone was to have “enough”?
- What is the carrying capacity of Planet Earth? How does technology affect the carrying capacity? What determines the carrying capacity of the planet, or a nation, or a region?
• How has technology decreased sustainability? How can technology improve sustainability?
• How can we learn from “patterns of change”?
• In what areas is it healthy to compete and in what areas is it more healthy to cooperate?
• How can we increase the number of self-governing communities without causing anarchy?
• What are the macro-constraints within which human societies must learn to live?
• What kinds of rules would be necessary to live cooperatively in the global village? What kinds of rules govern other villages?

Introducing Concepts in the Classroom

I have found that one of the best ways to introduce concepts is “clustering,” a form of concept mapping that Gabrielle Rico uses as a brainstorming strategy for creative writing. It is a simple and extremely useful technique for creating a collective cognitive map, sometimes called a mind map or a concept map. The process is simple: The teacher puts the concept on the board or on a sheet of newsprint, draws a circle around it, and invites students to brainstorm any words that come into their minds. The words are added to the map either arbitrarily or by connecting each new word to one already on the board. The only rule is that anything goes. The teacher must avoid the temptation to edit the contributions of the students. Comments like, “How does that fit?” or “Are you sure that’s what you mean?” send messages that soon discourage anyone from participating. This is not the time for discussion or detailed explanations. These can come later. It is appropriate and often helpful for the teacher to add words that he or she thinks might help students understand or use the concept. Figure 6-3 is a clustered concept map created by a sixth grade class as an introduction to a discussion about global cooperation.

In addition to introducing new ideas and concepts to students, clustering provides the teacher with useful information. For example, it is a great way to discover misconceptions or lack of understanding such as those that often occur in math. For example, a second grade teacher whose children were having difficulty with simple addition and subtraction problems decided to cluster the two concepts, addition and subtraction. She found, to her surprise, that more than half her students didn’t understand what the concepts meant. When she acknowledged in my workshop that “of course, they understand ‘more than’ and ‘less than,’” I suggested that the problem was a language problem not a conceptual problem. Once her students understood that addition always meant “more than,” and subtraction always meant “less than,” their math scores improved almost overnight. A fifth grade teacher couldn’t seem to make her students learn about fractions until she first associated “fraction” with “a part of.” I would venture to suggest most of the difficulty students have with math would be eliminated if teachers learned ways to introduce math principles and concepts in simple, understandable ways before moving on to “math facts.”

In another workshop, I suggested to a high school math teacher whose inner-city students couldn’t understand how to find the area of a triangle, that he try clustering the concept of area. He found that while all of his student understood what the concept, area, meant, e.g., turf, only a few had associated what they already knew with the formal mathematical definition that he had been using in class. Thereafter, when he asked students to determine the “turf of a triangle,” almost everyone got it right. They knew the correct formula. They just couldn’t conceptualize what he was asking them to do. Once he was certain they understood the concept, he reintroduced the formal definition and demonstrated how it was related to their own experience of “area.”

Figure 6-3
Clustering the Concept “Cooperation”
Clustering also helps teachers find out what students already know. I have had many teachers share their surprise to find that almost without exception, whenever they introduced a new concept one or more of the students already understood it. Based on the clues that other students gain from those who already know it, the students often learn the concept without additional help from the teacher. Following a clustering session, I have found it useful to have the class, either collectively or in cooperative teams, create their own shared definition of the concept. If these definitions need expanding, as with a more formal definition, the teacher can add whatever is necessary to insure that students have fully grasped the relevant implications of the concept.

Since math is often the most difficult subject to incorporate into an integrated curriculum, Donna Stockman’s seventh grade team decided to design an integrated unit around three concepts that were being taught in math — reasoning, problem-solving, and communication. In the process, students learned that these concepts are relevant to more than just math and that different subjects — science, social studies, literature, and art — provide a different perspective on each of the concepts. In addition, students learned that not only is the content of the various subjects different, but the processes, while similar, are also distinctive in each discipline.

Concept mapping is also a powerful strategy for helping students understand the relationships that exist among concepts. Joseph Novak and D. Bob Gowin (1984) provide an excellent discussion of concepts and their role in learning as well as a series of suggestions about how to introduce concept mapping at the various grade levels. As with clustering, concept maps help teachers see how students conceptualize the relationships among the various concepts being studied. Seldom, if ever, are two concept maps exactly alike, and students can learn from each other by comparing and contrasting their mental models. While there is no such thing as a “wrong” concept map, teachers can often tell when a student is confused about the meaning of a particular concept. Concept maps become marvelous crib sheets for remembering detailed information. After one high school biology teacher taught his students how to make concept maps, they created a huge room-length concept map on a chalkboard. Throughout the year, as new concepts were introduced, they were added to the map. This map became a powerful shared cognitive organizer for everyone in the class and often engendered in-depth discussions about the relationships among the concepts. Figure 6-4 is a concept map for the integrated unit “What does it mean to be human?”

Perhaps the most effective way to introduce these concepts is to have students “discover” them by studying natural communities. There are a variety of very powerful hands-on activities that provide an experiential introduction to some of these ecological principles. One of the best resources for such activities is Steve Van Matre (1972, 1974). His Institute for Earth Education has developed a series of highly imaginative experiential activities and programs designed to teach many of the same concepts discussed here. At Thompson, teams have often begun the year with field trips to a nearby prairie, a farm, or to the Fox River, which runs through St. Charles. The sixth grade students also participate in outdoor education programs, which are ideal opportunities for students to gain some in-depth understanding of these concepts. For example, Ruth Ann Dunton’s team designed a program where students explored five different ecosystems — prairie, pond, marsh, decidu-
ous forest, and pine forest — using the same systems concepts discussed above. Because these principles had been used to frame their studies since the beginning of the semester, students were familiar with them and were able to apply them in a natural setting with ease. Later, in the spring, the students conducted a river study, which allowed them to explore the Fox River from the same perspectives.

Two of the eighth grade teams used a visit to the restored prairie at nearby Fermilab as the basis for an integrated science unit using the concepts of diversity, change, and structure/function. The purpose of the trip was

NOT for students to memorize specific facts but instead to internalize the “feel,” the “look,” the “smell,” and the “sounds,” of the prairie.... It was exciting to see students of all ability levels apply knowledge and skills learned in the science classroom to the activities they participated in on the field trip — and then to see them bring their field trip experiences into other academic classrooms, e.g., using a prairie background for a play being performed in Language Arts. It was obvious that they had experienced the real thing. The questions generated by our study of the prairie ecosystem were investigated throughout the year and served as sources of additional questions on many different topics.

**Conclusion**

Given the centrality of concepts in thinking and learning, it is surprising to find that few teachers have any idea of how knowledge is structured or the role that concepts play in thinking and learning as we interpret and make meaning from our experiences of the world. Their ignorance is illustrated by the sixth grade teacher who, in a workshop, shared her concern that students couldn’t remember how to do math word problems from one day to the next. They could do them on Friday, but by Monday had apparently forgotten the process. I suggested that they had a problem with concept development. Obviously surprised at my suggestion, after giving it some thought, she agreed. Her response was: What can I do about it?

I have found that once teachers understand how concepts can be used in curriculum design and are then introduced to the ecological concepts, they have no difficulty in identifying relevant applications in their own subject areas. For example, when I first introduced the ecological concepts discussed above to the Thompson teachers, I assigned each faculty team one of the concepts that was written on a sheet of newsprint. Then, with a teacher on each side using a different color magic marker, they brainstormed all of the connections they could think of in their particular subject. After a few minutes, they rotated and, after reading what had been written by the other teacher, repeated the process. They continued the process until everyone had written on all four sides. The result was a colorful collage of ideas all of which, in one way or another, related to the original concept. Not only had each team created a resource for curriculum planning that could be used in the coming months, they had also learned a strategy that could be used in the future both among themselves and with students.

On another occasion, I had the opportunity to work with the St. Charles High School department chairpersons to identify a short list of concepts that could be used as a “vertical framework” by teachers in all disciplines at all grade levels. I asked each participant to list the five concepts they considered to be essential to an understanding of their disciplines. The three that appeared most often were *interdependence, diversity, and structure/function*. Systems and change were also included in several lists. The process that I began with the department chairs was later expanded to involve other members of the district-wide curriculum committee, which included teachers and administrators from the various levels. A few months later the committee finalized a list of eight concepts that could be used as integrative principles both horizontally across disciplinary boundaries and vertically across grade levels. The eight concepts are: systems, diversity, structure/function, change, balance, sustainability, interdependence, and valuing.

While these concepts have no formal status within the district, they are being used informally. For example, seventh grade social studies teacher Dan Kroll decided to design an entire unit around the
concept of values and valuing. One of the unique features of this unit was the flexible schedule agreed upon by the team. Dan had the students for five consecutive periods a day for a full week. This provides an exciting opportunity for continuity and intensive participation, with some team work and some individual work. When the week was over, students expressed appreciation for the opportunity to study something without the normal interruption that meant starting all over again each day.

Dan first had students brainstorm a list of current social problems, e.g., environmental damage, homelessness, hunger, crime, violence, and intolerance. This was followed by a discussion of the values that seemed to control the thinking and action which led to these problems, e.g., right and wrong, responsibility, power, greed, sportsmanship, and innocent until proven guilty. Each day students clipped articles from the Chicago Tribune and placed them in personal portfolios along with a brief written summary of each issue and related values. The final product was a poster collage reflecting a value message that the student wished to convey with the poster. One girl created a poster on political leadership. She collected pictures of all the world’s political leaders she could find and identified them by name and country. Across the poster in bold letters was the slogan, “Would you buy a used car from these guys?” The poster’s effectiveness was demonstrated by a lengthy all-class discussion about political leadership in general and some of the world’s leaders in particular. In a roundtable discussion at the end of the unit, Kroll found that “students could not believe they talked at home during dinner about the daily news. Even parents were surprised at their comments and maturity on these social issues.” Needless to say, students have a much more complete understanding of values and valuing as a result of the unit.

Whether discussed individually or as a group, because of their universal relevance, these ecological concepts provide a powerful conceptual framework that encompasses all disciplines and all knowledge. Whether one is learning previously constructed knowledge or constructing new knowledge from bits of information, this framework can become an indispensable aid for lifelong learning.

References
