

# Connections in the Classroom

or “The Kingdom of Heaven is Like Unto a Mustard Seed . . .”  
or “Life is Like a Box of Chocolates . . .”

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Jesus Christ and Forrest Gump got their points across effectively by teaching with parables and similes. They made a connection between familiar things in order to teach difficult and complex subjects. We all know that analogical thinking is useful. It must be, because we were all tested on the GRE with “Miller Analogies.” Remember “DOG: MISTRESS :: HUSBAND:?”

One of our most important jobs (and one that we frequently do not attend to) is to make connections between our disciplines, courses, and subjects. I have found that my teaching is more effective and that student learning is enhanced if students can be led to the common ground of academia. Our colleague in the English Department, Laura Dabundo, addressed this subject in this newsletter in the Winter 1994 issue . . . “We must strive to break down the artificial barriers that separate courses in a curriculum . . . We hope in doing so that those ultimately artificial divisions and limitations between disciplines would dissolve and that students would practice the learning that draws intellectual connections in integrated, collaborative thinking as part of the growth of knowledge and the development of skills to deal with it. So, what are some connections between biology and economics? Does the “Law of Thermodynamics” have any application outside the sciences? Is there any commonality between biological evolution and language evolution?”

## There Are Two Kinds Of Connections:

1. Linear connections, in which developments in one discipline lead to changes or new paradigms in another discipline. Linear connections are well described by James Burke of the PBS television series “Connections.” An example of a linear connection is the development of the printing press and its effects upon the spread of the Protestant Reformation, which then had effects on other areas.

2. Parallel connections, in which the same or similar theory or paradigm develops independently in separate disciplines. These parallelisms are sometimes called isomorphisms.

Whatever we call these connections, similes, analogies, parables, parallelisms, or isomorphisms, they are important concepts and effective teaching tools. Here are a few examples that I have found useful.

## The Whole Is Greater Than Its Parts

(Principle of Synergism, Principle of the Greater Good)

**Biology:** Individuals seek mates and reproduce for selfish reasons (sexual gratification, instinct). In so doing, they unconsciously and cumulatively cause population increase and increased fitness. (Charles Darwin, paraphrased).

**Economics:** Individuals work and earn wages for selfish reasons (food, shelter). In so doing, they unconsciously and cumulatively cause societal economic growth and prosperity. (Adam Smith, paraphrased).

## Empty Places Are Filled

(“Nature abhors a vacuum”; Spinoza, Ethics, Pt. I, Proposition 15) (If you build it, they will come.”; Burt Lancaster, “Field of Dreams”)

**Biology:** Vacant habitats will be occupied by living organisms 1) if the organisms can migrate to the habitat and 2) if the organisms are physiologically/genetically adapted to the habitat. Vacant ecological niches will be filled by adapting species 1) if appropriate variations occur and 2) if isolation is effective.

**Marketing:** If a market need exists, an entrepreneur will supply that need 1) if investment capital exists and 2) if marketing space is available. Or, in another phraseology... In a free enterprise system, vacant markets are soon occupied.

## Older Systems Are More Diverse Than Younger Systems

(Generalists are replaced by specialists.) (Age and craftiness beat youth and innocence every time.)

**Biology:** In the process of biological succession (old field, weedy field, pine forest, hardwood forest, for example), later stages are more species-rich and complex than early stages. The number of ecological niches is higher in later successional stages. “Pioneer” species tend to be more adaptable and to have wider ranges of distribution. “Climax” species tend to be more specialized and to have smaller distribution patterns.

**Anthropology:** Occupational diversity in early human cultures was low. There was little occupational specialization. Later societies became occupationally diversified because of an increase in the number of “niches.” Anthropologists call this “cultural evolution.”

**Marketing/economics:** Recently-opened shopping malls should show low shop diversity; older malls, because of years of competition, should show high shop diversity with numerous specialty shops. This is an untested hypothesis of mine. I have had students research this hypothesis but they were unsuccessful because of taxonomic or classification problems in enumerating the “species” of mall shops. Is a cookie shop classifiable as a separate “cookie-shop species” or should it be lumped with other specialty food shops as the “food species”? What should we do with Rich’s and Penney’s?...Are they big single “multipurpose species” or divisible into many separate “department species” (cosmetics, lingerie, shoes, etc.)?

### **Complex Diverse Systems Are More Stable Than Simple Low-Diversity Systems**

(Don’t put all of your eggs into one basket.)

**Biology:** The Chestnut Blight fungal disease destroyed almost all American Chestnut trees, but the eastern forest ecosystem survived with little perturbation because the high species diversity of the forest buffered the system against instability. The role (niche) of the Chestnut was filled by other species. A converse example is that Southern agriculture was a low diversity monoculture (Cotton was King) at the turn of this Century. The attack of the boll weevil destroyed the dominant species and the entire agricultural system collapsed. Southern farmers learned a lesson in crop diversification and stability of income.

**Economics:** A diversified stock portfolio is usually more stable and less subject to catastrophe than a portfolio with only a few stocks. In other words, diversified investment is low-risk; specialized investment is high-risk.

### **Sometimes Quality Works Best; Sometimes Quantity Works Best.**

(Slow and steady wins the race ... unless there is a Porsche entry.)

**Biology:** There are two types of “life-strategies”: 1) the “r-strategy” used by small-bodied, short-lived species with high biotic potentials, who produce offspring in large numbers, and who have little parental investment and 2) the “K-strategy” used by large-bodied, long-lived species with low biotic potentials, who produce offspring in small numbers, and who often have considerable parental investment.

The “r-strategy” is the “quantity” approach. High reproductive rates are balanced by high mortality, resulting in few (but sufficient) survivors. High birth rate + High death rate = Population. Bacteria, mice, and annual plants are examples. The “K-strategy” is the “quality” approach. Low reproductive rates are balanced by low mortality, resulting in enhanced survival. Low birth rate + Low death rate = Population.

Elephants, humans, and oak trees are examples. *Both strategies work for the species that employ them.*

**Marketing/economics:** There are two marketing strategy extremes: 1) Low price + High volume = Profit (The

“Wal-Mart Strategy”) and 2) High price + Low volume = Profit (The “Lord & Taylor Strategy”)

**Promotion/tenure:** There are two portfolio strategies: 1) Low quality achievements + High quantity achievements = Promotion? and 2) High quality achievements + Low quantity achievements = Promotion? These strategies are often the choices of students during examinations and assignments: “If I don’t know the answer (quality), can I ‘shoot the bull’ (quantity)?”

### **Isolation Results In Differentiation**

(Absence makes the heart grow fonder.)

**Biology:** Depending upon the degree and time span of the isolation, populations of organisms develop inheritable differences because of adaptation to local environments. This results in the formation of ecotypes, varieties, races, and (if the isolation is complete and of long duration) species. **Linguistics:** Depending upon the degree and time span of the isolation, populations of humans develop linguistic/cultural differences. This results in the formation of dialects, and (if the isolation is of long duration) different languages.

### **Principle Of Entropy**

(There is no such thing as a free lunch.) (Steaks cost more than carrots.) (S-t Happens!)

**Biology:** In a typical food chain of “sunlight, Producer/plant, Primary consumer animal, Secondary consumer animal,” energy is “lost” at every feeding transfer because of maintenance needs of the organisms and because of transfer inefficiency. Vegetarianism is more energy-efficient than meat-eating.

**Economics:** In a “manufacturer, wholesaler, retailer, consumer” sales sequence, prices increase at every step because of profit-taking and overhead expenses of the levels involved. It is cheaper to buy wholesale than retail because “middleman” costs are eliminated.

I am continuing to work on connections/analogies. Other biological ideas for which interdisciplinary connections probably exist are the ecosystem concept, hierarchical organizations, biological cybernetic systems, intra- and inter-specific interactions (predation, parasitism, commensalism, competition, mutualism, protocoperation), carrying capacity, and, of course, other aspects of evolution and natural selection. This essay is also an appeal to colleagues in other disciplines to share your “connections” with me and others. •