

SYLLABUS BIOLOGY 1120/FALL/09 PRIBOR

Syllabus statement: In the UT Academic journey, the elements of your UT education – from the first year beginnings to the capstone experience – link together as related stages of learning. UT Core and major courses, opportunities for research, community engagement, and ongoing assessment mark the unique path you are taking and are touchstones along the way. Through guided reflection and engagement, you will see these varied learning experiences in their connections to your own life and to broader social challenges. This K-Course is an intersection and connecting point for themes and paths in your UT Academic Journey.

TWO OVERALL THEMES OF BIOLOGY 1120/FALL/09

Theme One: Present core ideas of biology by means of and as an exemplar of student-teacher constructivism that promotes creative learning that: 1) opposes mechanistic knowing; 2) involves metaphorical, conceptual knowing; 3) focuses on constructivism that generates: (a) scientific constructivism that *opposes liberal education*; (b) narrative, scientific constructivism that includes scientific constructivism; (c) narrative constructivism that includes narrative, scientific constructivism and more emphatically *opposes the patriarchal dogmatism of liberal education but includes modified versions of its spiritual values*.

Theme Two: Dynamic Process of Life Transcends Static, Mechanistic Knowing

Relation of Course Themes, Content, and assigned Papers to Guidelines for K-Courses.

The two overall themes for this course relate to and advance one of the four themes agreed upon at the Academic Journey workshops in February of 2009 devoted to the development of K-Courses “that provide students the opportunity to incorporate diverse knowledge in an experience that is ‘integrative and theme-based.’” The relevant, agreed upon theme is: “Science and Sensibility: Ways of Knowing.” My two themes promote an alternative to liberal education that includes several of the values of this type of education. In particular, it promotes integration of diverse kinds of knowing, creativity, feeling values, and spiritual values, especially those that relate to US Democracy.

The first required paper, see course information, synthesizes course methods and content with both the “ways of knowing” theme and the second of the four agreed upon themes, which is “Health, Wellness, and Community.” One’s level of human self-consciousness, as for example, the young person moving from adolescence, through puberty, to young adulthood, is a very important, if not the most important aspect of health and wellness. What many people, especially young persons, do not realize is that as life goes to irreversible chaos, that is not the end of one’s story; rather, it is a beginning of a new phase of that story. Typical types of chaos for young people are transforming from high school mentality to young, rational adult mentality, breaking up of a romantic relationship, various challenges to one’s athletic, emotional, or intellectual capabilities. My model of “life, death, rebirth” is based on the second law of thermodynamics, which is the most fundamental principle underlying all of science. It is important for young people to see this and show their understanding of it by writing about it in relation to their personal experiences.

The final paper, see course information, relates primarily to the “ways of knowing” theme. In particular, based on their personal experience of creative learning in this course, students are asked to indirectly “vote” for or against transformation from mechanistic, conveyor style teaching to student-teacher constructivism. This paper also relates to the wellness and health theme in that many intellectuals and educators believe that the current high school and college education teaching-learning communities, especially science education, are sick. For the sake the health and wellness of US communities, education must undergo a major

transformation. Of course educators must embrace chaos in order to see new possibilities, such as presented in this course, and transform to a new educational order.

Outline of Course Content

- I. Core Concepts in Physics for Understanding the Non-Life Aspects of Life
 - A. Life-nonLife hierarchy
 - B. Motion in space (work event, work potential, kinetic energy, potential kinetic energy)
 - C. Temperature
 - D. Change in temperature (heat event, heat potential, thermal energy, potential thermal energy)
 - E. Contrast work event—kinetic energy with heat event—thermal energy
 - F. Two aspects of energy: potential and flux
 - G. First law of thermodynamics
- II. Break from Mechanistic Knowing
 - A. Concept of entropy
 - B. Second law of thermodynamics
 - C. Theory of machines transcends mechanistic knowing
 1. Characteristics of any machine
 2. Ideal heat machine
 3. Metaphorical, conceptual understanding of potential and flux (the 2 aspects of energy)
 4. Seven generalizations from the functioning of an ideal heat machine
 - D. Five laws of physical mutualities
- III. Systems Theory of Individuation (Self-Organization) as Exemplified by the Emergence of Life on Earth
 - A. Origin of life: a uroboric puzzle
 - B. Summary of uroboric puzzles
 - C. General solution to uroboric puzzles; emergent properties
 - D. Systems theory of individuation
 1. Overview
 2. Rejection of gross reductionism
 3. Summary of systems theory
 4. Subtle reductionism of systems theory
- IV. Individuation to Objective, Control Individualism
 - A. Participatory embedded knowing
 - B. Individuation to non-embedded knowing
 - C. Individuation to an objective mind self expressing objective, conceptual language knowing, concrete operational knowing, conceptual mythical knowing
 - D. Theory of metaphorical, conceptual knowing
 - E. Patriarchal ideology and nine contrasts between masculine persona and feminine persona
- V. Individuation to Scientific Constructivism
 - A. Intellectual diversity problem
 - B. Constructivism
 1. Realism: intellectual, participatory constructivism
 2. Degrees of constructivism related to skepticism
 3. Pre-Socratic, arete constructivism
 4. Constructivism of Plotinus and Ptolemy's mathematical model
 5. Copernican model
 - C. Metaphorical aspects of measurement
 - D. Newton's metaphorical mathematical theory of gravity

- E. Emergence of modern science
 1. Limited version of scientific constructivism
 2. Systematic experimentation
 3. Scientific method
 4. Scientific positivism
 5. Manichaeian modernism
- VI. Homeostasis
 - A. Types of stability
 - B. Negative feedback regulation
 - C. Positive feedback mechanisms
- VII. Cell As a Homeostatic Machine
 - A. Cell theory
 1. Some concepts of chemistry and chemical make up of a typical cell
 2. Internal structure of a typical cell
 - B. Cell as a biochemical machine
 - C. Cell as a homeostatic machine as exemplified by negative feedback regulation of cell volume
 - D. Cell duplication as foundation for biological evolution
 1. Enzymes as regulators
 2. DNA duplication via replication and protein synthesis
- VIII. Human Body As a Homeostatic Machine that Expresses Conscious Feelings and Levels of Self-Consciousness
 - A. Homeostatic body plan and the circulatory system
 - B. Nerve cell communications and the nervous system
 - C. Neuro-endocrine system
 - D. Immune system that is a component of the neuro-endocrine-immune system
 - E. Central nervous system
 1. Feelings defined as conscious emotions
 2. Triune brain
 3. Homeostatic (negative feedback) reflexes of physiological arousal
 - a. Regulation of blood pressure
 - b. Regulation of body temperature
 - c. Regulation of carbon dioxide in the blood
 - d. Regulation of glucose in the blood
 - e. Regulation of water concentration in the blood
 - F. Feelings generated by physical-psychic stress that produces health or illness
- IX. Mendel's Theory of Genetics that Is an Exemplar of Narrative, Scientific Constructivism
 - A. Mendel's first law understood in terms of two types of cell division (mitosis and meiosis)
 - B. Mendel's first law exemplifying narrative, scientific constructivism
 - C. Mendel's first law exemplifying scientific constructivism can lead to ideology of positivism
- X. Epigenesis, that is, Development
 - A. Definition and component processes
 - B. Stages of human embryonic epigenesis
 - C. Stages of development of human biological sexuality illustrating epigenesis
- XI. Biological Theory of Evolution
- XII. Narrative Constructivism Understanding of Evolution
 - A. Three defining features of any evolutionary process
 1. Order, chaos, hierarchal new order
 2. Trial-and-error coupled with a selection process

3. Context or environment in which trial-and-error process is occurring further selects those stable collaborations that continue to survive
 - B. Metaphorical understanding of the three features of any evolutionary process
- XIII. Three Features of the Evolution of Modern Science
- A. Newtonian mechanistic science embedded in democratic, free market system
 - B. Core of the unifying paradigm of any normal science is non-ideological pragmatism, which involves “trial-and-error” independent of ideology
 1. Because of non-ideological pragmatism
 - a. Normal science eventually leads to revolutionary science in which there is a battle between different approaches to solving scientific problems
 - b. Revolutionary science eventually leads to the emergence of a new unifying paradigm
 2. Practicing scientists confronted with diverse approaches to studying nature always embrace some integration of these diverse approaches
 - a. Some scientists choose integral-aperspectivism
 - b. Reject absolutized diversity of mere aperspectivism, that is, “humanities postmodernism.”
 3. Just as biological evolution has no intrinsic meaning or known goal, modern science has no intrinsic meaning; nor does it evolve toward an ever greater approximately true knowledge of nature
 - C. Science embedded in US society
 1. US society is internally divided: positivism versus traditional values
 2. Non-ideological pragmatism of science generates lack of commitment to any ideology
 - a. Materialistic, circular, reinforced pragmatism: attack on all ideologies
 - b. Many American students and faculty tend to be apathetic
 - c. Is a manifestation of postmodernism from the 1960s countercultural revolution
 - 1) 1970 – 1980s: radical, subjective, control individualism
 - 2) 1990s – present (2009): radical, ego constructivism
 - 3) Economic crisis, September 2008
 3. Election of Barack Obama who represents the emergence of the fourth enlightenment involving
 - a. Evolution to narrative constructivism
 - b. Collaboration between participatory subjectivity and control objectivity
 - c. Human collaboration between Eros-chaos and Eros-order to achieve creativity and individuation