BIOL 0110 – Fake Math: Analyzing the Misuse of Quantitative Concepts

Course Description

The world is awash with quantitative concepts. For many people the veracity of quantitative concepts is even more difficult to determine and to interpret than those of non-quantitative concepts. Quantitative errors, which have a wide range of modalities, can be the basis of misunderstanding of many issues and events in today’s society.

This course will present, discuss, and challenge students to discover and analyze misused quantitative concepts. Quantitative errors from the following areas will be presented:

1. Basic numerical concepts
2. Logic errors
3. Graphing inaccuracies and misleading presentations
4. Cognitive Illusions
5. Probability and Conditional Probability
6. Statistical analyses and interpretations
7. Correlation, Confounding, and Causality
8. Miscellaneous (These concepts will be taken from such concepts as inappropriate heuristic assumptions, self-fulfilling prophecies, the wrong-but-often-relied-upon Law of Small Numbers, hazards of data-mining, circular reasoning, and, of course, post hoc ergo propter hoc.)

The didactic approach will be the presentation of specific types of quantitative errors and the analysis of examples of those types. The students also will be pressed to find additional examples and perhaps new paradigms of quantitative error-types.

This course will address this phenomenon in several ways.

1. Numerous examples of the misuse of quantitative concepts will be presented and evaluated. Many of these will be presented as class exercises to be evaluated in small groups prior to discussion.
2. Basic quantitative methods of analysis—such as logic, probability, and statistics—will be demonstrated and taught.
3. Techniques to analyze quantitative concepts will be presented, discussed, and practiced.
4. Additional and present-day examples of misuse will be researched and evaluated: these to include popular media, scientific publications, and popular press.
5. Students will be given feedback on their essays.