# Biology 102, "The Natural World": An Experiential Science Class for Non-science Majors

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## Extended Abstract

Westminster College's Biology 102, "The Natural World," is a general science course in a laboratory-based format for non-science majors. Before 1993, students fulfilled their liberal education requirements with a specialized class in astronomy, biology, botany, geology, or physics. "The Natural World" (URL: *http://people.westminstercollege.edu/departments/science/)* is designed by a multidisciplinary group of professors to provide a broader view of science.

The centerpiece of the class is field research on the campus' creek and riparian community. This project gives the student an opportunity to ask a scientific question, create main and alternative hypotheses (Kinraide and Denison, 2003), and specialize in research: Geology and Hydrology (physical setting and flow), Water Chemistry (composition of creek water), Microbiology (bacteria), Aquatic Invertebrates (aquatic insects, flatworms, leeches, snails), Terrestrial Invertebrates (arthropods, earthworms), or Plants (flowers, grasses, shrubs, trees). The specializations allow students to cooperate on tasks as team members.

During the creek project, students identify, observe, and measure using instruments (digital camera, dissecting and compound microscopes, identification key and herbarium, ion probes, ruler, scale, soil sieve, agar plate, thermometer). Collected data are modeled with drawings, diagrams, graphs, and equations, and then analyzed in order to falsify and corroborate hypotheses. Recording the development of their ideas, students connect their results to scientific knowledge, and finally present a slide show, and written report with citations. The student discovers principles of the natural world by applying the scientific method.

Supporting features of the class include learning how to classify, construct dichotomous keys, read scientific prose critically for evidence and argument, and write short, reflective essays. Going on day trips to the nearby Great Salt Lake and Wasatch Mountains - hypersaline ecosystems, migratory bird flyways, fault-block mountains, glaciated landscapes, and life zones - allows students to experience natural history.

Much is learned also from teaching "The Natural World" class. There are a variety of (even basic) scientific definitions and approaches among scientist-teachers (Lederman, 1997). Specific information and skills, as well as generalized inquiry, are helpful. What is particularly needed is the ability to evaluate any improvements in critical thinking of students after completion of the class. In contrast to traditional lectures, inquiry classes are often a new experience and require adaptation, preparation, coordination, and innovation from both student and instructor.

The goal of “The Natural World” is to integrate scientific knowledge. The class text (Trefil and Hazen, 2004) lists 24 “big ideas:” Science, Newton's laws, Energy, Heat, Electromagnetism, Relativity, Atom, Quantum, Chemical reaction, Chemical bond, Nuclear energy, Quark and Lepton, Stellar fusion, Big bang, Nebular hypothesis, Rock cycle, Biogeochemical cycle, Ecosystem, Life, Biopolymer, Cell, Gene, Biotechnology, and Natural selection. Other lists could emphasize biology, social science, or technology (Micikas, 1996). Through inquiry in these integrated ideas, the student can acquire learning skills and interest in the natural world.

## References

Kinraide, T.R., and R.F. Denison. 2003. Strong inference: the way of science. American Biology Teacher 65:419-424.

Lederman, N.G. 1997. Students and teachers’ conceptions of the nature of science: a review of the research. Journal of Research in Science Teaching 29:331-359.

Micikas, L.B. 1996. Designing a biology curriculum that promotes scientific literacy. Teaching students the “big ideas” in the life sciences. Journal of College Science Teaching 25:431-434.

Trefil, J., and R.M. Hazen. 2004. The sciences: an integrated approach. Fourth edition, John Wiley and Sons, Hoboken, New Jersey, 640 pages.