

SOUTHEAST MISSOURI STATE UNIVERSITY

Department of Biology

Course No. BS 618

Title of Course: Topics in Biology Education

New: Summer 2004

I. Catalog Description and Credit Hours of the Course

Topics in biology education are addressed using a wide variety of activity-rich, inquiry-based approaches. While the course is a biology course, multiple instructional methods adaptable for K-12 science teaching and learning will be modeled. This course is intended to strengthen the biology content background of graduate students who have majors or certification endorsements in areas *other than* biology, while updating content for those with certification in biology. The specific content of the course will be flexible to accommodate the needs and interests of the students, but will center on major themes in biology. (3 credit hours)

II. Prerequisites

Graduate status, permission of the instructor.

III. Purposes or Objectives of the Course

The primary purpose of this course to strengthen the biological subject matter knowledge of teachers who are certified in areas other than biology and to strengthen or update those with certification in biology. Major themes in biology are emphasized, including evolution, genetics, and ecology. Most topics will be initiated with “real world” issues such as overpopulation or genetic counseling, and will use these issues to explore the underlying biology via pedagogies such as Problem Based Learning. The course is taught with investigation-rich and technology-rich methodologies, including emerging computational tools in areas such as genomics. Adapting the instructional methods modeled in this course to the students’ own teaching settings is a key feature.

IV. Expectations of Students

1. Students will attend all sessions and participate in all class activities and assignments.
2. Students will experience a variety of instructional approaches, and will discuss ways to adapt these methods for their classrooms.
3. Students will design a unit of process-oriented, investigative biology activities suited for the grade levels they teach.
4. Students will develop an annotated bibliography of resources for active biology learning, drawing on library, catalog and internet resources.

V. Course Content or Outline

- Evolution as the major explanatory theory of biology 10 hours
specific topics might include:
human evolution,
molecular clocks,
evidence for evolution
Pedagogies used will include
comparison of models, fossils, skeletons
computational tools (web based access to molecular alignment tools)
problem-based learning methodologies to encourage discussion and collaborative
problem analysis
- Organisms as expressions of their genetic codes 10 hours
specific topics might include:
Mendelian genetics,
molecular genetics,
gene expression
genetic engineering and cloning technologies,
ethics in biotechnologies,
genomics and bioinformatics
Pedagogies used will include
traditional lecture and genetics problem solving
use of animations freely available on web
use of webquests to stimulate discussion of ethics
use of case study for ethics questions
computational tools for investigating genetic similarities and differences across species
- Interrelatedness 10 hours
specific topics might include
relationships among species in a community,
relationships between organisms and their environment,
relationships at the cellular level (e.g., biochemistry, virology, immunology),
relationships of humans and the environment (pollution, overpopulation, use of natural
resources) (see conservation, below),
disease processes
Pedagogies used will include
computer based modeling of ecological systems using BioQUEST software
Flower-pollinator relationships shown with computer simulation on BQ software
powerpoint on the HIV epidemic
bioinformatics session on the genetic changes in HIV within a person
- Conservation biology 10 hours
specific topics might include:
population growth
endangered species/ extinction
natural resource use and abuse
ecological assessments
Pedagogies used will include
Field trips to demonstrate ecological sampling procedures
“Stream Team” materials (if available)
Games and non-computer simulations of natural selection
- Exams and student presentations of lessons: 5 hours

VI. Textbook and/or Other Materials or Equipment Required

An excellent college level general biology text will be a recommended resource (e.g., Biology by Neil Campbell). More advanced readings will be provided, drawn from a variety of books, professional journals and periodicals.

Access to a computer lab with internet access.

Biology software will be needed for some topics, provided by Biology Dept. and loaded onto the SEMO network.

VII. Basis of Student Evaluation (Grades)

Note: These percentages may vary according to the wishes of the instructor. Students will be notified of the relative weights appropriated to each element at the beginning of the course.

Exams (2)	40%
Annotated bibliography	20%
New Investigative labs	20%
Homework assignments and in-class activities	20%

I. Programs Served by the Course

Serves the MNS in Science Education degree program, the MA in Elementary Education and the MA in Secondary Education. Students in other degree programs with an interest in innovative biology teaching are encouraged to enroll.