Science Education (ESCI) 4440, Fall 2009
Science Teaching Methods for the Middle Grades
Mondays, Wednesdays, Fridays, 11:15-12:05
215 Aderhold Hall
pre- or co-requisite: CHEM 1060 or equivalent

Dr. David F. Jackson
University of Georgia
212 Aderhold Hall
(706) 542-1763
djackson@uga.edu

Course description, from UGA Bulletin:
Science teaching methods using classroom, laboratory, and field experiences. Development of a range of strategies appropriate for use with middle grades students. Special attention to examples and problems drawn from the physical sciences.

There is no single **textbook** for the course. Text materials will be extensive and will consist of photocopied material drawn from a wide variety of sources, in accordance with accepted Educational Fair Use guidelines. A large (at least 2 inch) three-ring binder for them is highly advisable. For those who are interested in further detail, a library of the entire books or journals from which these readings are drawn will be continuously built and maintained in Room 215 during the semester for reference and informal lending.

The **specific schedule** will be determined, week-to-week and day-to-day, based on the progress and input of the class, the occasional availability of field experience opportunities or guest instructors, coordination with CHEM 1060 activities, and, in the case of several outdoor lab activities, the weather.

A **web site** for the course may be accessed at http://djackson.myweb.uga.edu//ESCI4440.html and will be continuously developed and revised during the semester. To allow for maximum flexibility/responsiveness in teaching approach and emphasis, daily updates listing activities, readings, and assignments will typically be posted within a few hours immediately *following* (only partially and tentatively before) each class. As stated by UGA policy, "the course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary."

My available **office hours** are: most of the day on most Tuesdays and Thursdays; before or after class Mondays, Wednesdays, and Fridays.

Formal assignments, of which there will be approximately six during the course of the semester, will be practical lesson or unit design projects, designed to require creative and critical thinking about the issues being addressed. In order to accommodate preferences in working styles and schedules, students may choose to prepare and submit these either alone or as groups of as many as three people.

Late work policy: A formal assignment will be penalized 10% for lateness if submitted after it has already been returned to those who submitted it on time.

Mastery Learning policy: Any assignment may be redone *as a whole* (in a significantly different way or on a different specific topic) for a fully revised grade, if desired.

General grading rubric for each assignment/project/exam question:
100%: beyond the call of duty; strikingly impressive; excellent in every way
90%: both complete and showing some evidence of original thought
80%: all aspects of assignment minimally satisfied
<80%: one or more aspects of assignment missing or of unacceptable quality

Elements of Grade:
90% Six formal assignments, equally weighted
10% Final exam*

*Required, but with format and schedule highly flexible - see below.

Final exam items will be a series of practical problems, designed to require creative and critical thinking in applying general principles learned in the course to the potential use of specific, previously unfamiliar curriculum materials. The final exam will require some reading and preparation based on materials (text, video, and/or software-based) distributed or demonstrated during the last week of classes, and will be given on a time-limited but open-notes basis. The option of either a 30-minute oral interview or a traditional 3-hour written exam will be offered. The oral interview format is strongly suggested, has been customary for nearly all students in this course for many years, and may be scheduled at any mutually convenient time during the exam week (as with written exams, according to University rules, *not* earlier).

Attendance policy: Attendance and class participation are not in themselves a formal aspect of the course grade. My goal is to try to design class activities so that you feel that you are clearly missing something important if you are not present (both physically and mentally!). Polite but pointed inquiries will be made, however, about the reasons for repeated or habitual absence or lateness.

In accordance with the **University Honor Code and Academic Honesty Policy**, academic work must meet the standards contained in the UGA document *A Culture of Honesty*. Each student is responsible to inform themselves about those standards before performing any academic work. Details are available at http://www.uga.edu/ovpi/honesty/acadhon.htm.

Music will be played regularly during the 10-15 minutes immediately preceding class (in order to, as Bugs Bunny would say, soothe the savage beast). Everybody should take turns bringing in CDs, or else risk being subjected to my own wildly eclectic tastes.

Course Objectives ("Students will be able to..."):

Basic Principles of Science Teaching

- Gather, prepare, and critically evaluate several "*hands-on, minds-on*" *activities* appropriate for middle school students in each of several major physical science topic areas typically included in specifications of middle grades science objectives.
- List, describe, and demonstrate the major *science process skills*, and recognize, modify, and design middle-grades-level activities, including both single lessons and long-term, project-based units, appropriate for developing them.
- Describe and implement the *Learning Cycle approach* to science teaching and learning, and recognize, modify, and design related sequences of middle-grades-level activities, including both single lessons and long-term project-based units, using this approach.
- Describe and implement the *Conceptual Change approach* to science teaching and learning, and its application to overcoming specific common misconceptions in physical science.

Science Curriculum and Assessment Issues

- Select, modify, and construct *traditional assessment items* (e.g., multiple-choice, short-answer, problem, essay) with the goal of achieving the best possible balance between authenticity, efficiency, validity, reliability, and fairness.
- Select, modify, and construct *alternative assessments* based on student-produced artifacts with the goal of achieving the best possible balance between authenticity, efficiency, validity, reliability, and fairness, especially in evaluating project-based units and the development of integrated process skills.
- Describe and apply selected aspects of the *history and philosophy of science* that can inform physical science lesson and unit design.

Electronic Technologies in Science Teaching

- Describe examples of the advantages and limitations, as teaching tools for middle school science, of:
    - *computed-based lab equipment*, *photo and video cameras*, *spreadsheet and graphing utility applications*
    - *computer-based simulations* of natural phenomena, scientific problem solving, and science-technology-society issues