ADVANCED SECONDARY SCIENCE METHODS
EDSE 732

Course Information

Instructor name: Dr. Christine Lotter
Section: 001
Office: 223 Wardlaw
Office phone: 777-6593
Email: lotter@mailbox.sc.edu
Class meeting times: Thursday 4:30 – 7:15
Office hours: Thursday 2 pm - 4:30 pm
or by appointment
Cell: 917-7238
Course Credit: 3 hours
Prerequisites: EDSE 553 and EDTE 671
or instructor approval
Intended Audience: Graduate students interested in teaching science

Course Objectives and Organization

In this advanced secondary science methods we will emphasize connections between theory and practice. Many of the assignments will focus upon critical analysis of your classroom practice. We will discuss the strategies you'll need to support learners in understanding fundamental science concepts, learning about vital scientific processes, and understanding the nature of science. You will apply your growing understanding of science teaching by developing, enacting, and refining science curricula. One emphasis of this course will be on the idea of preparing to teach and analytically reflecting on your own and others' teaching. Thus, developing and teaching lesson "plans" will be only a part of what you'll do for these enactment activities.

During this course, you will:

• become familiar with current resource materials like AAAS Benchmarks, state standards, district objectives, and numerous science curriculum programs,
• prepare to carry on inquiry-oriented activities by engaging in investigations involving exploration and discovery,
• develop a deep understanding of the nature of science and its relationship with your teaching of science
• develop a laboratory safety plan
• write and teach differentiated lessons that help all students learn science (gifted, disabled, ESL, special education)
• develop teaching skills by preparing and implementing an in-depth unit plan illustrating various instructional strategies and learning technologies, and
• gain experience in preparing, teaching, and analytically reflecting on middle and secondary school science lessons while working with students in local schools.

EDSE 732 will be organized around the following themes:

- The nature of science
- Use of reform-based pedagogies to connect students to science (i.e., inquiry, cooperative learning, conceptual change, argumentation)
- Helping students learn from each other
- Supporting and assessing all students’ learning
- Science laboratory safety

This course will help prepare you for your A and B internships and your secondary science certification. You should be aware that failure to meet any one of the following requirements will result in a grade of F in one or more final (student teaching) internship courses:

- Participation for 12 weeks or 60 full days in the internship
- Teaching independently for a minimum of 10 full days in one placement/setting
- Assessed as “Competent” through ADEPT

**Course Reading Material**

1. Course packet of readings from Universal Copies (across from Wardlaw)

**On-line resources we’ll use extensively:**


*National Science Education Standards* are "the" standards for science teaching; though many states have their own standards or frameworks, they are generally in line with the NSES. They are available on-line at [http://books.nap.edu/html/nses/html/index.html](http://books.nap.edu/html/nses/html/index.html)

South Carolina Curriculum Standards


They are available on-line at [http://www.project2061.org/tools/bsl/default.htm](http://www.project2061.org/tools/bsl/default.htm)

(look for link to “benchmarks on-line”)

[http://www.project2061.org/tools/sfaaol/sfaatoc.htm](http://www.project2061.org/tools/sfaaol/sfaatoc.htm)

**Class Policies:**

1. You are expected to attend and participate in every class. If an emergency arises, you must inform the instructor prior to the class meeting of your absence.

2. Written assignments should be turned in at the beginning of the class period for which they are assigned. Assignments turned in after the beginning of class will be counted late. Late assignments will have 10% of their total value deducted for each day it is late.

3. Reading assignments are to be completed before the class meeting for which they are assigned.

4. Plagiarism will result in an F for the assignment. **Plagiarism** is defined in the USC student handbook as “the practice of copying from a book or other publication and not properly acknowledging that the words used are someone else’s” (p.12).

5. Any disrespectful or disruptive behavior may result in your being asked to leave the class, and may result in your dismissal with a “WF” (Withdraw Failing), and/or a referral to the Office of Student Judicial Programs

**Course Writing Assignments and Due Dates**

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<td>Nature of Science Paper (VNOS)</td>
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<td>Nature of Science draft Lesson plan</td>
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**Course Requirements and Grading**
A.  Note: Since this course is intended to help you become the best teacher you can be, it will be graded with a mastery perspective. The percentages listed here are approximate, but will give you a sense of the relative weight of each assignment. Expectations for these assignments are described on the following pages and will also be discussed in more detail in class.

15%  
**VNOS project**
This project involves the interviewing of students using the VNOS instrument. You are to conduct a "quasi-experiment" and write up a short paper of approximately 5 pages detailing your Introduction, Methods, Results, and Conclusions of your experiment. You must give your portion of the survey to at least 10 students and interview 2 of them.

5%  
**Draft Lesson plans (see handout for lesson plan format)**
- Write lesson plans incorporating the following strategies/topics
  - Nature of Science
  - Inquiry and Social Perspectives
  - Cooperative Learning
  - Conceptual Change
  - Argumentation

Final lesson plans will be incorporated into final curriculum project due at the end of the semester.

20%  
**Peer Teaching and Written Reflections**
1. You will be given a SC science standard and indicator and asked to develop a one day inquiry lesson plan (follow lesson plan format).
2. You will teach a lesson that incorporates a SC state standard and aligns with cooperative learning guidelines.
3. You will teach a lesson that incorporates a SC state standard and aligns with conceptual change theory.

For each lesson, you will teach 20 minutes (you will be timed) of this lesson to your peers in class or you will teach it during Internship A and videotape yourself and present portions of the tape in class. You will then write a 2-page reflection on the topic and your teaching of the lesson using a videotape of your teaching and critiques from your peers and teacher. You should include your knowledge of the concept and evidence of your teaching strengths, missed opportunities, and student learning in this written reflection.

5%  
**Case paper (3-4 pages)**
This assignment involves constructing a summary and synthesis paper for connecting the various ideas (teaching to diverse students, controversial topics in science) discussed in the case readings to class topics.
Laboratory environment project
Put together a safety module that demonstrates that you understand and can enact the NSTA standards for safety (see rubric):

a. Understand the legal and ethical responsibilities of science teachers for the welfare of their students, the proper treatment of animals, and the maintenance and disposal of materials.

b. Know and practice safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used in science instruction.

c. Know and follow emergency procedures, maintain safety equipment, and ensure safety procedures appropriate for the activities and the abilities of students.

d. Treat all living organisms used in the classroom or found in the field in a safe, humane, and ethical manner and respect legal restrictions on their collection, keeping, and use.

Presentation of Classroom enactments
Video tape a class or classes and select video segments that correspond to the ideas described in the NSTA Standards and class readings.  (Ideally this would be your attempt at utilizing these ideas. However, if this is not possible, use footage of a colleague or cooperating teacher.) This assignment is one of the major strategies to connect the ideas being discussed in class with your internship experiences. Each student will present 2 of the possible 9 portfolio standards (strengths, missed opportunities, and student learning) to meet the requirements of this assignment. These must be standards not already presented during the summer course. Final electronic portfolio part 1 due January 4, 2010 by 5pm

Final Unit Plan
A completed unit plan (see rubric) is to be turned in no later than Wednesday (12/9) by 5 pm.

B. Letter grades will be assigned on the basis of a percentage scale

F< 64

Tentative Course Schedule and Reading Assignments
In order to meet the changing needs of the class, this schedule may change as the course progresses! Furthermore, homework assignments may be assigned in class, in addition to the reading assignments listed here.

Class #1 (Nature of Science-Argumentation)
8/20

➢ What is this class all about?
➢ Argumentation Model Lesson
  o Read Article: Enhancing the quality of argument in school science (School Science Review, 2001)- PDF on Blackboard
➢ Inquiry Lesson and 5 essential features
➢ Discuss Portfolio Presentation and Final Course Project
➢ Assign standard for first inquiry mini-teach Due 9/3
Class #2 (Nature of Science and Inquiry- Student perspective)
8/27
- Read *Revising Instruction to Teach Nature of Science* (packet)
- Read *15 Myths of Science* article (*Skeptic*, 1997) (packet)
- Read article *Views of Nature of Science Questionnaire: Toward Valid and Meaningful Assessment of Learners’ Conceptions of Nature of Science* (focus on pages 497-502 and the questionnaire on page 509). (packet)
  - Students should complete the questionnaire for class
  - Students will plan a small research study involving the use of the VNOS instrument.
    - Final product will be a paper (approximately 5 pages)
      - Due date 10/1
    - Key components of paper should include:
      - Research question
      - Description of sample
      - Methods and Data
      - Findings
      - How the information from the study could be used to enhance the construction of curricular materials in your classroom.

Class #3 (Nature of Science and Inquiry)
9/3
- Present 20 minute inquiry lesson to your peers and turn in lesson plan.
- **Assignment:** Reflection on Teaching Due: 9/17

Class #4 (Diversity Issues in Science Education)
9/10
- Read Cases: *Night and Day with Jason, Scientists like me*, and *How Jonah got swallowed…*, (packet) and Read Chapter 8 from Textbook (on Blackboard)
- Interview a teacher regarding what strategies they utilize to teach to a heterogeneous class as well as for some “stories” regarding particularly challenging students (either disciplinary, motivational, gifted, emotionally, etc.) Be prepared to include these thoughts and anecdotes in class.
  - Class discussion based upon reflection questions and information gathered from teacher interviews.
- Diversity activities, student analysis
- **Assignment** – Write “Case Paper” connecting the big ideas from the three cases and Chapter 8 to the diversity issues discussed in class. Due 9/24

Class #5 (Cooperative Learning Strategies)
9/17
- Read *Chapter 1: Ten Frequent Questions* and *Chapter 4: Six Key Concepts* in Cooperative Learning (Kagan, 1994) (packet) and
- Read Chapter 9 in Textbook (on Blackboard)
- Cooperative Learning Model Lesson
  - Assignment: Mini-Teach Cooperative Learning: Due 9/24

Class #6 (Inquiry Continuum)
9/24
- Read *Embracing the essence of inquiry: New roles for science teachers*. (packet)
- Model Inquiry Lesson (Foam Lab)
Class #7 (Cooperative Learning Strategies)
10/1
- Review NSES Chpt. 6 (Focus on Science and Technology and Personal perspectives)
- Read Chapter 1 and 2 of Safety Book
- Read Case: Where’s the Science (packet)
  - Class discussion based upon reflection questions
- Teach mini-lesson Cooperative Learning and turn in draft lesson plan, Reflection due 10/15

10/8 No Class Fall Break

- Nature of Science paper due

Class #8 (Conceptual Change Instruction and Student Misconceptions)
10/15
- Read the three Cases: I like spotted owl., Feeling Sorry for Stephen, and Revisiting the Scope Trial (packet)
  - Class discussion on controversial issues
- Read Chapter 3 in Safety Book
- Conceptual Change model lesson
- Nature of Science Lesson Plan draft due

Class #9 (Supporting All Learners)
10/22
- Read Chapter 4 in Safety Book
- Assessment in the Science Class-strategies for improving student learning
- Differentiated Instruction
Assignment: Conceptual change lesson plan draft and mini-teach due 10/29

Class #10 (Conceptual Change and Student Misconceptions)
10/29
- Read Chapters 5 and one or two chapters 6-8 according to your discipline in Safety Book
- Teach Conceptual Change mini-lessons and turn in draft lesson plan

Class #11 11/5 (No class- SC2)
Curriculum Project and Portfolio Workday

Class #12 (Classroom Management and Safety)
11/12
Read: Chapter 5 in Text (on Blackboard), and Chapter 9-11 in Safety Book
- Safety Issues, Patty Hamilton OSHA presentation
- Argumentation draft lesson plan due

Class #13 (Safety in the Secondary Classroom)
11/19
Safety Test

11/26—No Class Thanksgiving Break
Class #14
12/3

- Individual Electronic Portfolio Presentations

Final written Curriculum projects are to be turned in no later than 5:00 pm, Wednesday, December 9, 2009

**Modes of Instruction:** demonstrations, group cooperative learning activities, lecture and discussions, peer teaching, student presentations

**Bibliography:**


