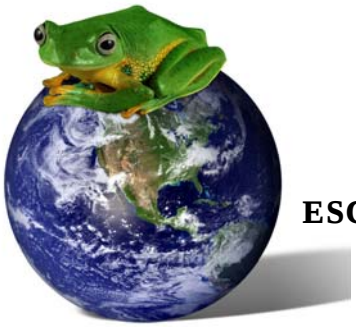

The University of Georgia

ESCI 6460/4460: Methods of Science Teaching

Fall 2008

INSTRUCTORS:

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TIME:

Fall Semester
Friday 8:00-11:00
August 22 – December 5, 2008
Room: 215 Aderhold Hall and The State Botanical Garden of Georgia (near Native Flora Garden)

Syllabus is subject to change depending on the dynamics of the class and instructors.

COURSE MATERIALS:

Required Books---

Chiappetta, E.L., & Koballa, T.R. (2008). *Science instruction in middle and secondary schools.* Upper Saddle River: Merrill Prentice-Hall.

Georgia Department of Natural Resources (2003). *Georgia adopt-a-stream: Educator's guide.* Atlanta: Environmental Protection Division. Retrieved on July 29, 2008, from http://aesl.ces.uga.edu/aascd/manuals.html

Koballa, T.R., & Tippins, D.J. (2004). *Cases in middle and secondary science education: The promise and dilemmas.* Upper Saddle River: Merrill Prentice-Hall.

Louv, R. (2005/2008). *Last child in the woods: Saving our children from nature-deficit disorder.* Chapel Hill: Algonquin Books.

Tippins, D., Thomson, N., Butler, M., Fowler, L., Lawrence, M. (2006) *Environmental dilemmas in Georgia: Considering alternate solutions.* Retrieved on July 29, 2008, from http://www.coe.uga.edu/mse/faculty/thomson/UGAScienceEdbook.pdf

Wilson, E.O. (2002). *The future of life.* New York: Vintage Books.

Required Materials--- Colored Pencils, Sketch Pencil, and Journaling Notebook w/ Plain Pages

Optional Resources--- American Association for the Advancement of Science (1993). *Benchmarks for science literacy: Project 2061.* New York and Oxford: Oxford University Press. Retrieved on July 29, 2008, from http://www.project2061.org/publications/bsl/online/index.php

Citizen Science Tool Kit (http://www.birds.cornell.edu/citscitoolkit)

Georgia Performance Standards (http://www.georgiastandards.org/)

National Research Council (1996). *National Science Education Standards*. Washington DC: National Academy Press. Retrieved on July 29, 2008, from http://books.nap.edu/openbook.php?isbn=0309053269

COURSE DESCRIPTION:
What pedagogical tools and instructional strategies will equip new teachers to teach in rich, academically rigorous, multicultural and environmentally sensitive ways, in science education? This course emphasizes general science teaching skills, environmentalism, multiculturalism, the role of the local community and environments in science teaching, and professional development. This course emphasizes the essential elements of classroom management, asking questions, guiding activities, and engaging in community and environmentally-centered projects through *citizen-science* methods of instruction. This course is also unique in that you will be asked to critically analyze several literary arguments related to science, and further develop your understandings of teaching investigation, writing, nature journaling and observation, and safety. This course emphasizes how teachers work with students to foster sustained scientific interests, and become informed such that they will have greater access to environmental decision-making.

ATTENDANCE POLICY:
This course is based on John Dewey's (1916/1966 *Democracy and Education*) philosophy that, "since growth is the characteristic of life, education is all one with growing; it has no end beyond itself. The criterion of the value of school education is the extent in which it creates a desire for continued growth and supplies means for making the desire effective in fact" (p. 53). This course welcomes the influences of everyday knowledges and skills, personal and shared experiences, ceremonies, mentoring relationships, beliefs and values, expectations and traditional narratives. Attendance and participation in discussions and assignments are required for educational growth, however, it is recognized that students get sick. Two missed classes are permitted this session. Arriving more than 30 minutes late or leaving class with 30 minutes or more remaining is counted as an absence. Please be prepared to discuss all absences with the professor and be aware that having more than two absences can result in you being dropped from the course.

ACADEMIC HONESTY:
The University of Georgia seeks to promote and ensure academic honesty and personal integrity among students and other members of the University community. In keeping with the University Honor Code and Academic Honesty Policy, each student is expected to do his/her academic work and to acknowledge fully any assistance and academic resources. All academic work must meet the standards contained in "A Culture of Honesty." All students are responsible to inform themselves about those standards before performing any academic work. Terms of this policy, resolution procedures, and consequences of violation are available at: http://www.uga.edu/ovpi/academic_honesty/culture_honesty.html

REQUESTS FOR MODIFICATIONS:
It is policy of the University of Georgia to make reasonable accommodations for qualified individuals with disabilities. If you are a person with a disability and want to request accommodations to complete your course requirements, please make an appointment with the course professors as soon as possible to discuss your request. For information on documentation requirements, contact the office of Disability Services (2-8719).

CHEMICAL RIGHT TO KNOW TRAINING:
By August 25, please provide verification that you have completed the "Chemical-Specific RKT Training for Laboratory Personnel," provided online: http://www.esd.uga.eud/rtkcs

NOTES ON CLASS DISCUSSIONS:
This course welcomes a caring style with respect to conversation and interaction with peers. A caring style encourages paraphrasing of others' thoughts and asking questions as a way to offer interest and demonstrate attentiveness. A caring style offers compassion when others are frustrated. A caring style offers support for ideas to obtain clarity prior to critique. A caring style monitors their time so that they are not monopolizing the conversation---allow quieter others to voice their positions. A caring style is responsible to others to ensure that the current topic is given enough attention. Contrasting views are also appreciated and help to clarify others' ideas---so offer contrasting views when appropriate but in a constructive and inclusive way that permits effective exchanges.

NOTES ON MEETING AT THE STATE BOTANICAL GARDEN OF GEORGIA:
The State Botanical Garden of Georgia is an extension of the University of Georgia, which offers different educational gardens and context of a natural environment to enhance our work together. Teachers will be outside during all weather conditions during the duration of the course, with the exception of extreme stormy conditions, and should be prepared with needed clothing and items (e.g., hiking boots, sunscreen, sunglasses, hat, umbrella, etc.). The purpose of meeting at the Botanical Garden is to engage in the competency of teaching science outdoors in natural settings. While teachers may be limited to teaching science in a classroom (indoors) for some topics, there are enormous benefits to engaging youth in the competency of investigating science out-of-doors. This course emphasizes citizen-science methods that can be easily justified by Georgia standards, which allows teachers to make the case that their students will benefit from doing science outside.

NOTES ON COURSE ASSIGNMENTS:
Quality work is expected from beginning teachers. Any writings require a bibliography or reference list and should follow the style of the fifth edition of the *Publication Manual of the American Psychological Association*. Materials may be returned if they do not meet expectations.

All assignments should be typed, spell-checked, grammatically correct and legible (dark print, 12-pt font, and single spacing with 1" margins). Late and make-up assignments are not permitted. Optional assignments are listed for the benefit of a student who misses a deadline for any reason.

ASSIGNMENT PROFICIENCY AND SUMMARY:
Assignment proficiency is achieved by meeting 90% of the required expectations for completing assignments (rubrics). Assignments may be re-completed to meet the proficiency requirements.

Assignment 1: Reflective Essay
The Reflective Essay is to show what you know about science teaching. Based on your knowledges and skills, experiences, beliefs and values, and expectations, provide a rationale for why you enrolled in this course and how you anticipate growing as a result. This essay should be at least five pages double-spaced and provide reasonable justifications for your perspectives. Justifications are reasons, facts, or explanations that are supported with evidence. If what you know about science teaching is that "the student takes notes," for example, then you may want to write about your experience in a middle or high school science classroom when a science teacher lectured while writing notes on the board and you were asked to take notes.

Assignment 2: Introduction Letter and Syllabus
The introduction letter is to show what you have learned about presenting yourself as a person and as a competent science teacher to students, guardians and parents. This letter should include your professional and personal interests. This letter should be one page single-spaced with details about how you intend to work with your students to foster sustained scientific interest so they may better access environmental decisions. The class syllabus is to show what you have learned about organizing your course, policies and procedures, discipline plan, and how a democratized classroom increases student participation. The syllabus should be 2-3 pages single-spaced with how you intend to foster a safe environment. Examples of both will be provided in class.

Assignment 3: Fire Safety Certificate
The fire safety training and certificate is to show what you have learned about how to deal with emergency situations such as a fire in the classroom. Wear appropriate clothing to extinguish fire (long-sleeved shirt, jeans, and sneakers. Note that your clothing may smell like smoke after class).

Assignment 4: Article for Science Scope or Science Teacher on Safety
The purpose of writing for the NSTA Journal *Science Scope* or *Science Teacher* is to show what you have learned about the role of safety and ethics, and the specific safety and ethical challenges related to your science content area. This article should be three pages double-spaced with at least two citations from other science education journal articles (not including the textbook) which further clarify the role of safety and ethics in your science area.

Assignment 5: Biodiversity Survey
The purpose of the biodiversity survey is to show what you have learned about how to engage students in the competency of the environments in which they live, as they become scientifically literate. The biodiversity survey will depend on your science content area (e.g., earth science, biology, chemistry, and physics). Collaborative groups around content areas will enhance this assignment. The biodiversity survey consists of an environmental mapping project, including survey protocols, and collecting and preparing specimens for your science teaching. The *Georgia Adopt-a-Stream: Educator's Guide* and several collaborating scientists will serve as our guides for this assignment. The biodiversity survey should be 3-5 pages, and show proficiency of presenting scientific data (e.g., illustrations, graphs, charts, tables, statistics, etc.), in the format of a guide for students, or working example that may be used to teach environmental mapping as part of biodiversity survey.

Assignment 6: Lesson Box and Presentation
The lesson box is to show what you have learned about how to construct and organize a set of materials (and collect and prepare "specimens") that will accompany a selected science lesson. The lesson box should contain a materials check-list, materials for a class of approximately 30, lesson plan(s) (or learning experiences), in a sturdy box to be used eventually with your students. (Materials may include items needed for the students to create their own scientific instruments.) The presentation should provide an overview of the lesson(s) and lesson box check-list/materials, a rationale for meeting grade-level appropriateness, and a rationale for why you selected this idea.

Assignment 7: Reflective PhotoEssay
The Reflective PhotoEssay is to show what you have learned about teaching science, classroom management, asking questions, guiding activities, safety, analyzing literature, and citizen-science. You are encouraged to take photos of the learning experiences you engage in (I will also have some photos to provide you). Provide a rationale (including examples) for how you have developed as a teacher. This essay should be five pages double-spaced with photos and provide detailed evidences for your positions. For example, if what you have learned is "how to put out a fire in case of an emergency," then provide a photo of this experience and write a short description of how this photo provides evidence of what you have learned to do.

NOTES ON PARTICIPATION IN LEARNING EXPERIENCES:
Part of your grade will be based on participating in the following learning field experiences. These experiences are designed to enhance your development and to help you do well with assignments. A short description of how these experiences will contribute to your development is offered below.

Daily Reflections
The daily reflections are designed to serve as a way of monitoring and adjusting the learning experiences based on the needs of the students in the class. Each class will end with a 15 minute reflection period for how we can apply what we have learned to science teaching, what challenges in science teaching what we have learned will help you with, and what else you need to know to use what we have learned effectively.

Collaborative Presentation and Discussion of Teaching Dilemma CASES
The collaborative presentation and discussion of teaching dilemmas is a community building experience which has the goal of facilitating the elaboration of beginning teacher's understanding that classrooms are dynamic and multifarious. Collaborative groups will read a case, summarize it, and generate a discussion and analysis of how this teaching dilemma might be approached in multicultural and environmentally sensitive ways. Each of the collaborative presentations should be approximately 5 minutes of case summary and 15-20 minutes of discussion.

Analytical Critiques
The purpose of critiquing literary works is to show the different ways in which scientific and non-scientific arguments can be analyzed with your students to develop constructive thinking skills.

As a class, we will work together to provide evidence for the following questions for each critique:

What were the author's reasons for writing this book? Is the purpose clear?
What is the central argument of this book? Is the central claim convincing?
Are reasonable justifications (e.g., research findings) offered to support the argument?
What are the conclusions? Do the conclusions logically follow the argument or findings?
What are the implications? Are fruitful directions offered? If not, then offer implications.
What are the strengths and weaknesses of the writing style used by the author(s)?

Collaborative Presentation and Discussion of Environmental Dilemma CASES
The collaborative presentation and discussion of environmental dilemmas has the goal of facilitating the elaboration of beginning teacher's understanding of complex ecological choices. Collaborative groups will read a case, summarize it, and generate a discussion and analysis of how environmental dilemmas can be used to design questions and science investigations of proposals found within literary works---as a way to emphasize the role that science plays in critiquing ideas. Each of the collaborative presentations should be approximately 5 minutes of case summary and 15-20 minutes of discussion.

Nature Writing
The purpose of this activity is to show the ways in which nature writing can be used to teach (and enhance) scientific observation skills and to generate scientific questions for investigations. Moreover, nature writing can be used as a way to elicit students' knowledges, beliefs and values, expectations, and shared experiences (as pedagogical knowledge) for teaching science knowledge. Nature writing can also be used as a way to make sense of non-scientific arguments such as ethics.

Professional Development Experience
The purpose of the professional development experience is to show how to engage students with community and environmental stakeholders so they can participate more fully in local decisions. There are two parts of the professional development experience. First, you will become informed about a current environmental problem concerning people in the local community. The first part of your assignment is to interview, survey, or collect data about stakeholders' viewpoints. Second, you will participate in the professional development experience with secondary science teachers who are also interested in the environmental problem and working toward developing lesson plans, to be used in the local schools.

Nature Journal
The purpose of the nature journal is to show how to enhance student's observation skills as a way to participate more fully in developing an understanding of complex relationships. Nature journaling can also be used as a way to critique literary works. The nature journal should be a journaling notebook with plain pages used to take field notes, drawings and sketches, photos or artifacts from your interactions at the Georgia botanical garden. This experience should be in the format of a guide for students, or a working example that may be used to teach field notes, nature journaling and science observation. The nature journal will be used with your biodiversity survey.

Optional Assignments:
TBD

TENTATIVE COURSE SCHEDULE

August 22 Room 215	Topic: *Introductions and Becoming Organized for School* Activities: Briefly discuss course syllabus, informal introductions, provide and discuss examples of middle school and high school syllabi (rules, polices, procedures, discipline plan), divide into collaborative groups for case studies 9am Dr. Steve Oliver (soliver@uga.edu) will present info on student teaching
August 29** Room 215	Topic: *The First Days of School and Thinking Through Teaching Dilemmas* 1. Assignment 1 2. Assignment 2 (first draft) 3. Read *Science Instruction in Middle and Secondary Schools*---Chapter 5 4. Read *Cases in Middle and Secondary Science Education*---Collaborative Presentation and Discussion of Four Teaching Dilemma CASES: (1)__ (pp. __-__), (2)__ (pp. __-__), (3)__ (pp. __-__), (4)__ (pp. __-__) Activities: Exchange introduction letter and syllabi for peer review--discuss, discuss Ch. 5 Science Instruction, Presentation and discussion of case studies (Next class session at the Botanical Gardens)
September 5** Botanical Garden	Topic: *Analyzing Literary Works in Science Class* 1. Assignment 2 (final draft) 2. Read E.O. Wilson's *The Future of Life* (Chapters 1-4, pp. 3-102) Activities: Science of the Botanical Gardens, discuss scientific justifications for arguments and ways to critique literature via science inquiry and writing.
September 12 Botanical Garden	Topic: *The Ethical Treatment of Animals and Plants, and Nature Writing* 1. Read J. Tallmadge's "Writing as a Window into Nature" 2. Read E.O. Wilson's *The Future of Life* (Chapters 5-7, pp. 103-190) Activities: Discuss non-scientific justifications for arguments and ways to critique literature via nature writing and making sense of ethical arguments.
September 19** Botanical Garden	Topic: *Field Notes, Nature Journaling, and Scientific Observations* 1. Read C.W. Leslie's "Teaching Nature Journaling and Observation" 2. Read Richard Louv's *Last Child in the Woods* (Part I & II, pp. 1-114) Activities: Discuss the philosophy of science (empiricism and scientism), ways to critique literature via field notes, nature journaling, and observation. Critique E.O. Wilson's *The Future of Life*
September 26** Botanical Garden	Topic: *Teaching Science w/ Essential Questions, and Asking Questions* 1. Read T. Wessels' "Reading the Landscape's History" 2. Read Richard Louv's *Last Child in the Woods* (Part III & IV, pp. 115-202) Activities: Discuss the significance of asking questions in science, ways to critique literature by asking different questions, develop essential questions.
October 3 Botanical Garden	Topic: *Environmental Dilemmas as a Source of Generative Questions* 1. Read Richard Louv's *Last Child in the Woods* (Part V, pp. 203-236) 2. Read *Environmental Dilemmas in Georgia*---Collaborative Presentation and Discussion of Five Environmental Dilemma CASES (1)__ (pp. __-__), (2)__(pp. __-__), (3)__ (pp. __-__), (4)__ (pp. __-__), (5)__ (pp. __-__) Activities: Presentation and discussion of cases, discuss generative questions as a way to critique literature by designing investigations of author proposals.

TENTATIVE COURSE SCHEDULE (CONTINUED)

October 10 UGA Environmental Safety Division Annex (near UGA Softball Fields) ---SASTE---	Topic: *Classroom and Fire Safety* 1. Read Louv's *No Child Left in the Woods* (Part VI & VII, pp. 237-327) 2. Read a selected article from *Science Scope* or *Science Teacher* on Safety 3. Read *Science Instruction in Middle and Secondary Schools*---Chapter 14 4. Assignment 3 Activities: Fire Safety Training and Certification
October 17 Full Moon Cooperative (CSA)	Topic: *Citizen-Science: Becoming Informed w/ Community Stakeholders* 1. Article for *Science Scope* or *Science Teacher* on Safety in Science Teaching 2. Read D. Edelson et al., "Learning to Make Systematic Decisions" Activities: Participate with community stakeholders to develop an understanding of local knowledge, beliefs and values, practices, expectations.
October 24** Botanical Garden	Topic: *Citizen-Science: Becoming Informed w/ Environmental Stakeholders* 1. Read *Georgia Adopt-a-Stream: Educator's Guide* (pp. __-__) 2. Assignment 4 Activities: Designing scientific investigations: stream monitoring. Teaching with everyday materials to do scientific investigations and nature journaling Critique Richard Louv's *Last Child in the Woods*
November 7** Botanical Garden	Topic: *Citizen-Science: Environmental Mapping and Biodiversity Survey* 1. Read *Georgia Adopt-a-Stream: Educator's Guide* (pp. __-__) Activities: Environmental mapping and biodiversity survey, different methods of collecting and preparing specimens for the science classroom.
November 14 Botanical Garden (TBD^)	Topic: *Citizen-Science: Service Learning, Participation and Advocacy* 1. Read J. Dewey's "The Teacher and His [Her] World" Activities: Work with local secondary science teachers to develop lessons for the local food movement (P.L.A.C.E.) in Athens and surrounding community
November 21** Room 215	Topic: *Socioscientific Issues, EcoJustice, and Environmentalism* 1. Read Aldo Leopold's "The Land Ethic" 2. Read a selected article on "EcoJustice and Science Education" Activities: Analysis of the role of metaphors through newspaper and advertising, and how they frame relationships with others and the Earth.
December 5 Room 215	1. Assignment 5, 6, 7

^Local science teachers will be working with us to develop lessons for the local food movement (P.L.A.C.E.) in Athens and surrounding community. Extra sessions for this work are voluntary.