



# The University of Georgia

## ESCI 4460/6460: Methods of Science Teaching Spring 2009/WEBCT Enhanced

### INSTRUCTOR:

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### TIME:

Spring Semester  
Monday 8:00-11:00  
January 12 – April 27, 2009  
Room: 220 Aderhold and Botanical Garden

### EDUCATIONAL PARTNERS:

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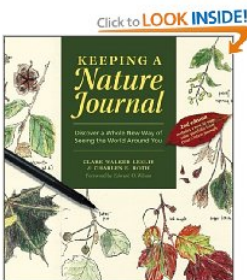
Anne Shenk ([ashenk@uga.edu](mailto:ashenk@uga.edu))

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.



Leslie, C.W., & Roth, C.E. (2003). *Keeping a nature journal: Discover a whole new way of seeing the world around you*. North Adams, MA: Storey Publishing.

Orr, D.W. (2006). *Ecological literacy: Educating our children for a sustainable world*. San Francisco: Sierra Books.

Rutherford, P. (2002). *Why didn't I learn this in college: Teaching & learning in the 21st century*. Alexandria, VA: Just Ask Publications.

#### 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 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>

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>

Walt Disney's "Eight Below" Movie (loan copies will be provided in class)

**COURSE DESCRIPTION** (*Aligned with the 2003 NSTA Standards 3, 4, 5, 7, 9, and 10*):

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 methods, teaching issues, 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 arguments for 'ecological literacy' 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](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 January 14, please provide verification that you have completed the "Chemical-Specific RKT Training for Laboratory Personnel," provided online: <http://www.esd.uga.edu/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* (NSTA Standard 5: General Skills of Teaching)

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 2-3 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* (NSTA Standard 5: General Skills of Teaching)

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* (NSTA Standard 9: Safety and Welfare)

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: Safety Plan* (NSTA Standard 9: Safety and Welfare)

The purpose of writing a safety plan (i.e., safety and welfare of students) is to show what you have learned about the role of safety and welfare in science education, and the specific safety and ethical challenges related to your science content area. This plan should be designed according to the Safety Plan Unit Rubric that will be provided in class.

*Assignment 5: Citizen Science Project* (NSTA Standard 3: Inquiry, NSTA Standard 4: Issues, NSTA Standard 5: General Skills of Teaching, NSTA Standard 7 Science in the Community, NSTA Standard 9: Safety, and NSTA Standard 10: Professional Development). The purpose of the citizen science project 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 project 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 project consists of an environmental mapping activity, including citizen science 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 project should be designed according to Citizen Science Rubric that will be provided in class, and show proficiency of presenting scientific data (e.g., illustrations, graphs, charts, tables, statistics, etc.), in the format of a teacher's guide for the GEORGIA CITIZEN SCIENCE EDUCATION NETWORK, for your students, or working example that may be used to teach environmental mapping, biodiversity survey, and other citizen science methods discussed in class.

*Assignment 6: Ethical Decisions Simulation* (NSTA standard 9: Safety and Welfare)

This simulation is to show what you have learned about the ethical treatment of animals and plants in relation to preparing students to engage in citizen science methods of science inquiry. The ethical decision learning experience involves: 1) select a children's video appropriate for secondary science with key science concepts relevant to your content area, 2) identify the key ethical dilemmas and situations embedded in the movie, 3) develop a 2-3 page simulation narrative that sets the stage for your learning experience, 4) develop 2 hands-on science labs to foster students' problem solving and critical thinking skills in relation to the science concepts identified, 5) develop an ethical decision-making activity to compliment your learning experience.

*Assignment 7: Reflective PhotoEssay* (NSTA Standard 5: General Skills of Teaching)

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* (NSTA Standard 5: General Skills of Teaching)

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.

### *Reading-Teaching Assigned Articles and Books, Analytical Critiques* (NSTA Standard 4: Issues)

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)?

### *Nature Writing & Journal* (NSTA Standard 2: Nature of Science and NSTA Standard 3: Inquiry)

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. 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 citizen science projects.

### *Professional Development Experience* (NSTA Standard 10: Professional Development)

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. The first part of this assignment is to learn about the local food movement in Athens, Georgia by participating with a community supported agriculture (CSA) project. The second part of this assignment is to brainstorm ideas for local food learning experiences that will contribute to the new food curriculum for Athens schools.

### *Optional Assignments* (TBA)

TENTATIVE COURSE SCHEDULE (MONDAYS 8:00-11:00am)

<p><b>January 14 WED</b> Aderhold Room 220</p> <p>Handout Videos, "Eight Below" (1/2 of the class)</p>	<p>Topic: <i>Introductions and Becoming Organized for School</i></p> <p>Activities: Briefly discuss course syllabus, informal introductions, provide and discuss examples of middle school and high school syllabi (rules, polices, procedures, discipline plan), <b>discuss research activities for spring semester.</b></p> <p>Organize reading-teaching teams.</p>
<p><b>January 19 MON</b></p> <p>^Assignment 1</p>	<p>Martin Luther King, Jr. Holiday ---- No Class</p> <p>--- Reading Team 1: <i>Ecological Literacy</i>, "En'owkin" p. 11          --- Reading Team 2: <i>Ecological Literacy</i>, "Speaking for" p. 18          --- Reading Team 3: <i>Ecological Literacy</i>, "Solving for" p. 30          --- Reading Team 4: <i>Ecological Literacy</i>, "The Power" p. 41          --- Reading Team 5: <i>Ecological Literacy</i>, "Values" p. 45          --- Reading Team 6: <i>Ecological Literacy</i>, "Fast-food Values" p. 49          --- Reading Team 7: <i>Ecological Literacy</i>, "The Slow School" p. 56</p>
<p><b>January 26 MONDAY</b> Aderhold Room 220</p>	<p>Topic: <i>The Ethical Treatment of Animals and Plants (**Chemistry block)</i></p> <p>Activities: Discussion of "Eight Below" and Antarctica Adventure Simulation, <b>organize collaborative teacher-teams and discussion of Assignment 6 Rubric.</b></p>
<p><b>February 2 Botanical Garden</b></p> <p>Anne Shenk, BOT GARDENS, Educational Director</p>	<p>Topic: <i>Introduction to the State Botanical Gardens of Georgia</i></p> <p>Activities: Tour of the Botanical Gardens, Orange Creek Trail, and Programs.</p>
<p><b>February 9 Environmental Safety Division Annex (near UGA softball fields)</b></p> <p>^Assignment 2</p>	<p>Topic: <i>Classroom and Fire Safety</i></p> <p>Activities: Fire Training and Certification (^Assignment 3)</p> <p>--- Read "Chapter 14" in <i>Science Instruction in Middle and Secondary</i>          --- Read a selected article on safety in <i>The Science Teacher</i> or <i>Science Scope</i></p>
<p><b>February 16 Aderhold Room 220</b></p> <p>^Assignment 4</p>	<p>Topic: <i>Ecological Literacy, Multiculturalism, and Citizen Science (GCSEN)</i></p> <p>Activities: Teaching and critiquing "Vision," different cultural spaces, and teaching science investigation through citizen science methods of pedagogy.</p> <p>--- Reading Team 1: <i>Ecological Literacy</i>, "Indian Pedagogy" p. 67          --- Reading Team 2: <i>Ecological Literacy</i>, "Okanagan Education" p. 68          --- Reading Team 3: <i>Ecological Literacy</i>, "Place and Pedagogy" p. 85          --- Reading Team 4: <i>Ecological Literacy</i>, "Recollection" p. 96          --- Reading Team 5: <i>Ecological Literacy</i>, "On Watershed" p. 107          --- Reading Team 6: <i>Ecological Literacy</i>, "Helping Children" p. 111          --- Reading Team 7: <i>Ecological Literacy</i>, "Finding Your" p. 126</p>

	TENTATIVE COURSE SCHEDULE (Continued)
<p><b>February 23</b> Botanical Garden</p> <p>½ of period---first planning session (bring materials needed to begin planning ethical decision simulation w/ your groups)</p>	<p>Topic: <i>Environmental Mapping and Biodiversity Survey Methods</i></p> <p>Activities: Teaching and critiquing “Tradition/Place,” environmental mapping, biodiversity survey, collecting and preparing specimens in science.</p> <p>--- Read <i>Nature Journaling</i>, “Forward” and “Part 1: Getting Started” p. vii  --- Read <i>Nature Journaling</i>, “The Ongoing Journal” p. 65  --- Read <i>Nature Journaling</i>, “The Winter Journal” p. 89  --- Review <i>Nature Journaling</i>, “Part 3: A Seasonal Celebration” p. 137  --- Read <i>Nature Journaling</i>, “Part 4: Learning and Teaching” p. 171</p>
<p><b>March 2</b> Full Moon Cooperative (CSA)</p>	<p>Topic: <i>“Science Issues in the Community” as Professional Development</i></p> <p>Activities: Participate in farming activities at the Full Moon Farms (CSA)</p>
<p>March 9</p>	<p>Spring Break ----- No Class.</p>
<p><b>March 16</b> Botanical Garden</p>	<p>Topic: <i>Nature Writing and Journals</i> (**Earth Science Block)</p> <p>Activities: Granite outcrop ecosystems and/or contour mapping activities</p> <p>--- Reading Team 1: <i>Nature Journaling</i>, “The Spring Journal” p. 105  --- Reading Team 2: <i>Nature Journaling</i>, “The Autumn Journal” p. 73  --- Reading Team 3: <i>Ecological Literacy</i>, “Revolution” p. 135  --- Reading Team 4: <i>Ecological Literacy</i>, “Leadership” p. 149  --- Reading Team 5: <i>Ecological Literacy</i>, “It Changed Everything” p. 161  --- Reading Team 6: <i>Ecological Literacy</i>, “Raising Whole Children” p. 175  --- Reading Team 7: <i>Ecological Literacy</i>, “Mediations” p. 184</p>
<p><b>March 23</b> Aderhold Hall---- planning session 2</p>	<p>Topic: <i>Science Teachers and Students as Ethical Decision-Makers</i></p> <p>Activities: Ethical decision-making learning experience planning and design.</p>
<p><b>March 30</b> Botanical Garden</p>	<p>Topic: <i>Citizen Science Design</i></p> <p>Activities: Teaching and critiquing “Relationship,” citizen science teamwork.</p> <p>--- Reading Team 1: <i>Ecological Literacy</i>, “Dancing” p. 193  --- Reading Team 2: <i>Ecological Literacy</i>, “The Loupe’s” p. 206  --- Reading Team 3: <i>Ecological Literacy</i>, “Tapping the Well” p. 213  --- Reading Team 4: <i>Ecological Literacy</i>, “Sustainability” p. 227  --- Reading Team 5: <i>Ecological Literacy</i>, “Rethinking School” p. 241  --- Reading Team 6: <i>Ecological Literacy</i>, “Changing Schools” p. 250  --- Reading Team 7: <i>Ecological Literacy</i>, “Resources” p. 259</p>

	TENTATIVE COURSE SCHEDULE (Continued)
April 6 Botanical Garden	Topic: <i>Fungi Investigations and Citizen Science</i> (**Biology Block)  Activities: Fungi investigations and activities.
April 13 Room 215 ^Assignment 6	Topic: <i>Preparing Youth as Ethical Decision-Makers and Stakeholders</i>  Activities: Ethical Decisions Simulation (TBA)
April 20 Room 215	Topic: <i>Citizen Science Investigations</i>  Activities: Citizen science teamwork.
April 27 ^Assignment 5 ^Assignment 7	----- Topic: <i>Citizen Science Investigations and Discussion Luncheon</i>  Activities: CS Discussions and PhotoEssays.