ESCI 4420: Science for Early Childhood Education

Fall 2006

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The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.

Required text

Krajcik, J.S., Czerniak, C.M., & Berger, C. (2003). *Teaching science in elementary and middle school classrooms: A project-based approach (2nd edition)*. Boston: McGraw-Hill.

Additional texts

Articles/chapters to be distributed in class

Reference materials (available online)

Georgia Performance Standards
http://www.georgiastandards.org/science.aspx

American Association for the Advancement of Science. (1990). *Science for All Americans: Project 2061*. New York: Oxford University Press.
http://www.project2061.org/publications/sfaa/online/sfaatoc.htm

American Association for the Advancement of Science. (1993). *Benchmarks for Science Literacy*. New York: Oxford University Press.
http://www.project2061.org/publications/bsl/online/bolintro.htm

National Research Council. (1996). *National Science Education Standards*. Washington, DC: National Academy Press.
http://fermat.nap.edu/openbook/0309053269/html/index.html

National Research Council. (2000). *Inquiry and the National Science Education Standards*. Washington, DC: National Academy Press.
http://fermat.nap.edu/openbook/0309064767/html/index.html

Course description

This course is intended to introduce prospective elementary teachers to the practice of teaching science. Building upon current research on science teaching and learning, we will explore:

- Elementary science curriculum and state/national science education standards;
- Learning environments and science instruction that support students' understandings of science content and the nature of scientific knowledge;
- Forms of assessment that tap students' understandings of science;
- Science instruction that supports the goals/needs of diverse groups of students.

Objectives

My main goal is to guide you to become a reflective practitioner. Being reflective means being thoughtful and critical about the science learning experiences you enact in your classroom. In order to enact productive science learning experiences for your students, you must consider the backgrounds and experiences your students bring to your classroom. You must be thoughtful about the experiences you provide for your students, and you must consider how these experiences support their understandings of science. Being a reflective practitioner involves continuously evaluating your understanding of science content, your goals for student learning, the manner in which you engage students in science content and processes, the ways in which students participate in science learning experiences, and the ways in which students show evidence of meeting your learning goals.

Please keep in mind that teaching science (or any topic) is a highly complex practice. The complexity arises from the nature of scientific knowledge, your understanding of science, the understandings of science your students hold, and your ability to orchestrate science learning experiences in your classroom. I do not intend to provide you with specific activities that apply to all teaching situations. This approach would be unrealistic given the complexity of the context in which you will be teaching. For this reason, the goal of becoming a reflective practitioner is of the utmost importance. As a prospective teacher it is your responsibility to learn how to negotiate the complexities in your classroom and determine which instructional strategies will meet your needs and goals, as well as the needs and goals of your students. Therefore, the intent of this course is to help you develop competencies that enable you to make informed curricular and instructional decisions in your classroom.

The specific goals for this course include:

1. Developing and reflecting on your science content understanding, as well as your understanding of the nature of scientific knowledge. Teaching science requires that you understand the content well enough to respond to students' ideas and to guide them to construct increasingly more sophisticated understandings of science.
2. Becoming familiar with research on science learning (e.g., students' conceptions of science, how these conceptions influence science learning, how teaching practices support science learning, etc.).

3. Developing competencies that allow you to make informed decisions about curriculum and instruction in your classroom.
4. Understanding how to employ various forms of assessment to evaluate student learning and how to adjust instruction in relation to information gained from assessment.
5. Developing an understanding of diversity and equity and an understanding of how you can organize your teaching practices to meet the needs of all students in your class.
6. Developing an understanding of your goals as a teacher of science and reflecting on how the decisions you make about curriculum and instruction support or hinder these goals.
7. Developing habits of mind that allow for professional development. This course is one step toward becoming a science teacher. In order for you to serve your students well, it is important that you continue to refine your ideas about science teaching and learning.

Assignments

Reading response papers (10%)
The readings for this course are integral for developing and reflecting on your ideas about science teaching. You are responsible for submitting a response paper for each reading assignment. You should discuss the major points in each reading, as well as how you think the issues raised in the reading are important for understanding science teaching and learning. Response papers should be approximately one page in length. Additionally, please write 2 questions for discussion. You may skip 2 response papers without penalty.

In class assignments (10%)

Curriculum evaluation—We will examine state and national science standards throughout the course. I will ask you to complete written, in-class assignments in connection this activity.

Investigations—We will engage in several science investigations throughout this course. These investigations are intended to (1) provide you with an opportunity to reflect on your understanding of scientific content and processes and (2) model inquiry-oriented science instruction. I expect you to participate in these investigations, and I will ask you to complete written, in-class assignments that accompany these investigations.

Using text resources in elementary science (10%)
Children's literature can be a useful resource when teaching science, particularly if you select texts that can be used to support conceptual understandings. You will work in groups for this assignment. Your group will identify and evaluate text resources (e.g., trade books) you could use to when teaching one of the content areas in the Georgia Performance Standards (Earth

Science, Physical Science, and Life Science). We will discuss criteria for evaluating text resources in class. Each group is responsible for sharing their findings with their peers via presentation and written materials.

Field experience assignments (parts 1 & 2 to be completed during field experience; part 3 to be completed at the end of field experience)

1. **Students' understandings of science (15%)**
   Select one of the following:
   a. Interview three students about their ideas about a particular science topic. Try to select students who represent the range of the overall population in the class.
   b. Write and administer an assessment about students' understandings of a science topic (review the research literature to get a sense of students' conceptions of particular topics and develop assessment items in relation to research findings).
   c. Conduct a science lesson for the students in your class.
   d. Please feel free to propose a project to fulfill this assignment, although please consult me prior to beginning your project. If you choose to propose a project please explain how it addresses students' understandings of science.

2. **Teacher and/or curriculum perspectives (15%)**
   Select one of the following:
   a. Interview your cooperating teacher about his/her perspectives on science teaching and curriculum materials
      i. What curriculum materials are used in this class?
      ii. Who decides which curriculum materials to use (e.g., teacher, school, or district)?
      iii. What are the criteria upon which curriculum decisions are based?
      iv. In what ways are these curriculum materials useful? In what ways are they limiting?
      v. How much time is allotted for teaching science?
   b. Examine science curriculum materials used in your field experience classroom
      i. What curriculum materials are used in this class? How would you describe the nature of these materials (e.g., inquiry-oriented, hands on, etc.)?
      ii. How do these curriculum materials relate to state/national science standards?
      iii. What types of assessments are integrated into the curriculum? In what ways are these assessments informative?
   c. Please feel free to propose a project to fulfill this assignment, although please consult me prior to beginning your project. If you choose to propose a project please explain how it relates to teachers or curriculum.

3. **Your perspective on science teaching (10%)**
   a. Reflect on what it means to teach science in an elementary classroom. Specific questions to be addressed include:
      i. What are you most excited about in terms of teaching science in your classroom?

ii. What most interests you about teaching science?
iii. What do you find most vexing about the prospect of teaching science in your classroom?
iv. Why do find these things vexing?
v. How do you propose to address your vexation and why do you think this is a fruitful solution?

Field experience presentation/discussion (5%)
Following field experience, each person in the class will be expected to share her or his experiences in the classroom. The purpose of this presentation/discussion is to allow you and your peers to debrief one another about teaching science in elementary classrooms. Please be prepared to discuss Parts 1 & 2 of your field experience assignment (e.g., what you learned from students, what you learned from teachers).

Microteaching (10%)
Following field experience we will do a microteaching activity. The purpose is to allow you to plan and implement a science investigation. An important part of learning how to teach science involves developing competencies that enable you to support students' science investigations. The microteaching activity is intended to give you an opportunity to experience the range of practices associated with pulling off a science lesson in your classroom.

If you teach a science lesson during field experience you can opt to be exempt from the in-class microteaching assignment. Instead, you will be expected to lead a class discussion about the lesson you taught. The purpose of this is to share with your peers the insights you gained from your teaching experience.

Final exam (15%)
The final exam will be comprehensive. It will require you to synthesize and reflect on your ideas/experiences associated with science teaching and learning. Be prepared to describe your perspective on elementary science teaching. This will be a take home exam.

Course Policies

Attendance and participation/professionalism
Attendance and participation/professionalism will affect your final grade. Regular and punctual attendance is an important part of this course. *If you miss more than two class sessions your final grade will drop by one grade level (e.g., from A- to B+).* Exemptions may be granted in cases of serious illness, death in the family, religious observance, and other events that fall under the guidelines for an excused absence. Please inform me in advance if you are going to be absent from class.

As a class, we will explore and develop ideas related to science teaching and learning. Your participation will enhance the quality of your experience and that of your classmates. Participation involves being a thoughtful contributor to class discussions and activities. I expect that you will come to class prepared to participate in our class discussions. *Your final grade will drop by one grade level (e.g., from A- to B+) if participation/professionalism becomes problematic*.

All assignments must be handed in on or before the day they are due. If an assignment is late, there will be a reduction of one grade level per day overdue. I expect you to type and proofread your assignments. (Response papers do not have to be typed.)

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 (http://www.uga.edu/~ovpi/honesty/ah.pdf).

Please turn off your cell phone prior to coming to class (i.e., no phone calls and no text messaging).

Grading
Your final grade will be calculated based on the following:
100-93=A, 92-90=A-
89-87=B+, 86-83=B, 82-80=B-
79-77=C+, 76-73=C, 72-70=C-
69-67=D+, 66-63=D, 62-60=D-
Below 60=F

Keep in mind that you choose the quality of the work you submit. You can earn an A by submitting assignments that exhibit exemplary quality.

If you are unsatisfied with your performance on an assignment, you may revise and resubmit it. Please note that this policy does not apply to exams. You must submit your revised assignment no later than one week after the assignment was returned to you. Your final grade on the assignment will be the average of the grade you received on the original assignment and the grade you received on the revised version.

DATE	TOPIC	READING (date assigned)	ASSIGNMENTS DUE
Aug 16	Introduction to the course Goals of science education	Settlage & Southerland chapter; *SFAA* pp. 1-12	
Aug 21	Nature of scientific knowledge Scientific literacy	Krajcik pp. 4-31	RR (S&S; *SFAA*)
Aug 23	Intro to inquiry-oriented science instruction	Krajcik pp. 37-54	RR (pp. 4-31)
Aug 28	Students' conceptions of science; prior knowledge	Krajcik pp. 54-71	RR (pp. 37-54)
Aug 30	Social constructivist teaching and learning	Krajcik ch. 4	RR (pp. 54-71)
Sept 4	Labor Day—no class		
Sept 6	Enacting inquiry-based science lessons	Krajcik ch. 7	RR (ch. 4)
Sept 11	Supporting conceptual understanding	Reardon article (distributed in class)	RR (ch. 7)
Sept 13	Assessing student understanding		RR (Reardon)
Sept 18	Text resources presentations	Ch. 3 of *Inquiry and the NSES*	**Text resources assignment**
Sept 20	State and national science standards		RR (*NSES*)
Sept 25	Curriculum evaluation	Settlage & Southerland chapter	**Curric eval assignment**
Sept 27	Diversity	Krajcik ch. 9	RR (S&S)
Oct 2	Assessment	TBA	RR (ch. 9)
Oct 4	Technology resources	TBA	RR
Oct 9	Informal science		RR
Oct 11	Preparing for field experience		
Oct 16—Nov 14 FIELD EXPERIENCE (fall break Oct 26 & 27) Parts 1 & 2 of field experience assignment due during these weeks			
Nov 15	Field experience presentations		**Part 3 of field experience**
Nov 20	Field experience presentations		
Nov 22	Thanksgiving break—no class		
Nov 27	Microteaching		
Nov 29	Microteaching		
Dec 4	Microteaching		
Dec 6	Microteaching Take home final distributed		
Take home final due Dec. 13 by 5:00 PM			