

**Department of Mathematics and Science Education**

**Secondary Science Teacher Education Program**

**Fall Semester 2004**

**ESCI 4450, ESCI 6450, ESCI 3450**

**INSTRUCTORS:** Dr. J. Steve Oliver  
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Office Hours: Before and after class, and by appointment

**COURSES:** ESCI 4450/6450 Secondary Science Curriculum  
ESCI 3450 Practicum in Teaching Science

**PREREQUISITES:** Admission to Teacher Education

**SCHEDULED TIME:** 1<sup>st</sup> and 2<sup>nd</sup> block -- Monday, Wednesday, and Friday

**SCHEDULED PLACE:** Cedar Shoals High School

**COURSE MATERIALS:** required text: *Science Instruction in Middle and Secondary Schools* by Chiappetta, Koballa, and Collette; *First Days of School* by Wong and Wong; additional required readings will be handed out on occasions during the quarter

**GOALS:**

This semester we are in the fifth round of trying a new method of conducting the secondary science teaching methods courses. I guess that is long enough that it is not new anymore. Rather than conduct the courses mostly in classrooms on campus with a portion in schools, we have taken the entire program to the schools. We believe that this is the place where the greatest progress toward becoming a teacher can be made. Our pre-service science teacher education program has been designed with a vision that results in exemplary science learning and teaching.

Although the format of the secondary science teaching methods block is non-traditional, the goals will remain largely the same. One goal is the implementation of a research-based rationale for science teaching. The articulation of a research-based rationale for science teaching serves as a mechanism for pre-service teachers to integrate

theory with practice. To accomplish this goal, pre-service teachers must participate in a variety of experiences to implement their rationale for science teaching.

Our secondary science teacher education program has five strands and six themes that will be evident in these classes. These strands include *science teacher with an understanding of the discipline of science and its nature, science teacher as communicator, science teacher as multicultural educator, science teacher as ethical decision maker, and science teacher as a reflective practitioner in school based experiences*. The six themes are learning, curriculum, planning, conducting instruction, evaluation, and ethics (moral philosophy), values, and beliefs.

Pre-service teachers need to develop into reflective practitioners, that is, teachers who make reasoned judgments based on propositional, case, strategic, and scientific knowledge within a teaching episode. Reflective behaviors cause pre-service teachers to draw upon the research-based rationale, experiences, the professional identity, and growth and leadership skills that must be integral to any teacher education program. For instance, a goal of these classes is to explore what it means to understand science concepts and to investigate how some learners may come to know and understand these topics. You will also examine how some students' understanding can be altered.

An assumption of these courses is that different individuals may have quite different ways of thinking about a particular scientific phenomenon and that these different ways of thinking may lead to a different response to teaching and learning in science. We'll explore how people make sense of selected topics in science and examine the implications of these understandings for teaching.

Another purpose of these courses is to provide an opportunity to continue your learning with regard to fundamentally important issues in teaching. These are educational issues you will struggle with your entire professional career. They include: What is science? Which knowledge and what knowledge are worth knowing? What counts as knowledge and as evidence of understanding? Whose needs or concerns are most important in a classroom? How are teachers and students supposed to interact? What are students' and teachers' ethical responsibilities? How do we design and implement meaningful and effective science curricula? How did you acquire the science knowledge that you have? What does this method of acquisition imply for your teaching?

Another goal of the pre-service science teacher education program is the socialization of prospective teachers within the society of teachers. This aspect of the program takes on a new significance with the movement into the school. Individual teachers become participating members who exhibit teaching competency and engage in continuing professional and personal growth and development. Continued personal and professional involvement, growth, and leadership include active membership in major professional organizations for science teachers such as NSTA (National Science Teachers Association), NABT (National Association of Biology Teachers), AAAS (American Association for the Advancement of Science), and GSTA (Georgia Science Teachers Association). The expression of a professional identity is one way to

**demonstrate that you believe that teaching is a profession.**

**Yet another aim of these classes is to introduce you to the levels of consciousness that a teacher must develop. Teachers must think about the content they teach, the needs of all of their students and how they, working with parents, can meet their students' needs, and the ways in which the students respond to the content, activities, assignment, and the teacher. Teachers make innumerable decisions of this type during a school day.**

**Finally, we wish to help you understand yourself better as a learner and prospective teacher so that you can be successful in helping students.**

### **CLASS STRUCTURE:**

**Most of the activities that you will do in this course will take place at Cedar Shoals High School.**

**Observation: One of the most important activities that you will do in the school is to observe the classes of an in-service science teacher. Occasionally you will observe a lesson taught in a secondary classroom by university instructors. While conducting this observation, you will make records about the activities of both student and teacher, frequently while considering the requirements of a specific observational task. On top of these activities, you will reflect on your teaching and write your reflections in a journal.**

**Teaching: On several occasions, each member of the class will teach a science lesson that will be observed by high school students, high school teachers, peers, and instructors. On some occasions, these lessons may be videotaped. Other teaching activities that will occupy a significant portion of your in-school time will include: tutoring and assisting the teacher. We hope you will have an opportunity to do all the activities that teachers do including: grading papers, cleaning the classroom, decorating the classroom, planning to teach, identifying resources, etc.**

**Attending classes: Throughout the semester, you will attend classes (usually at the high school) in which a university instructor or a classroom teacher will teach on a given topic. We are planning for the regular high school teachers to teach the lesson which applies to topics of their expertise.**

**Other activities: You will also be involved in activities that go beyond the teaching of classroom science so as to expand your understanding of the profession of teaching. These activities may include attending school functions, taking tours of the county, etc. For instance, we may choose to attend a football game together as a group.**

### **COURSE GRADES and Assignments:**

**1. Skills Lab** - You will find or design a laboratory activity which has the goal of teaching students to understand “how we know” a particular concept, theory, fact, etc as a result of science. For instance, if you wish for your students to learn "how do we know that DNA is the genetic material that contains the inheritable code?" then you will plan a laboratory activity to accomplish this. The lesson might have a historical focus, but not necessarily. You may choose to do this as a *true experiment*. We will define a *true experiment* as an activity in which variables are manipulated and a control is present. In the lab activity, this experiment would be one where the students are given a problem and must decide what hypothesis will be tested. Turn in the experiment in the form of a “student handout” along with an explanation of how you would use it with your students. Hopefully, you will teach this lesson to students. ***Due Monday, September 27, 10% of Grade.***

**2. Animation activity** – You will see animations that have been created to teach a science topic. In the activity, you will create a story board to make an animation of your own. ***Due Monday, October 25, 10% of the grade.***

**3. Mini Unit** - This assignment will involve a minimum of 3 days of teaching plans. You will turn in your word-processed lesson objectives, teacher activities, student activities, and materials needed for each day. ***Due \_\_\_\_\_, 25% of grade.***

**4. Instructional Unit and Resource File** - In this assignment, you will create an instructional unit on a focused topic. In fact everyone in the class will be creating a unit on essentially the same topic. We are going to make allowances for the different subject matter specialties. But working in groups of four, you will create a set of resources for teaching a topic. You will assign tasks to the members of your team. You will compare what you are creating with what other groups are creating. And you will hopefully get to teaching some of what you work on. The overall topic is related to biological productivity and energy conversion. The final product will contain: a resource compilation, a set of lesson plans, assessment tools, and a placement of the unit within a larger course.

***The resource file*** will need to contain: 3 articles from science education journals such as School Science and Mathematics, The Science Teacher, The American Biology Teacher, The Physics Teacher, The Journal of Chemical Education, The Journal of Geologic Education, etc.; 2 articles from popular science journals such as Discovery, Scientific American, etc. which can provide background information for you the teacher; one popular article which would be read by the students you are teaching; one reference to a textbook for the subject for which you are planning; and 2 activities that could be used to supplement your teaching (the WWW is a great place to look for these things). In addition, this file should include lists of suppliers or posters, sources for free and/or inexpensive materials (such as lab materials and video tapes) and providers of printed materials.

The lesson plans will need to include plans for teaching at least two weeks. You must include goals for the entire unit.

The assessment tools will include one major exam, a quiz, a worksheet, a homework sheet, and planned oral questions. *Due Monday, November 8th, 15%* of grade.

**5. Show and tell/ Drag and brag** - What activity did you observe in the classroom that you wish others had seen? Did you see a lab or lesson that you want to include in your own classroom? You are to write a description of the activity (and bring copies for everyone) and present the activity (abbreviated version - 5 minutes) to your peers. *Due Monday, Dec. 6, 10%* of grade.

**6. Reflective journal** - Perhaps the most important activity of the semester is the keeping of a reflective journal. In this journal you will record what you are thinking, feeling and learning each day. Entries should occur daily or at least every class day. These entries will help you keep up with what you are planning to do once you are out in a school for student teaching or in your own classroom. The journal will be graded for both the *Curriculum* and *Methods* courses. In other words, both Dr. Wallace and Dr. Oliver will be reading your journal. The first reading by the professors will require that you turn in the journal on \_\_\_\_\_. The final journal will be turned in on Monday, December 6<sup>th</sup>. *The journal counts 20% of the grade.*

**Your first journaling assignment is to write a one-page essay on the skills, affect and knowledge that you feel you either need to acquire or want to acquire in order to become the teacher that you wish to become.**

Below is given a table that is to serve as a guide for creating the reflective journal. At a later point in the semester, the members of the class in conjunction with the instructors will decide how this table should reflect a scoring rubric for the reflective journal. However, for the moment, it is intended to suggest questions that you should pose for yourself as you create the reflective journal.

Across the top are three categories: knowledge, affect and action. These categories will guide you to reflect and react to situations in your life as a pre-service teacher. Knowledge is for those situations where *what you know* is most important. Affect refers to those situations in which *liking or feeling* is the dominate cognition. Finally, action refers to those situations in which *doing* is the most important issue. These categories frequently overlap in practice, but it is important to remember the potential for separation as you think about teaching.

Down the side are types of situations; six have been identified though there could certainly be others. These situations are largely self-explanatory. But consider the following situation. During a class session you have just taught on *the age of the earth* a student has repeatedly challenged you about the different claims for the age of humanoid fossils that have been found around the world. You don't think he is addressing a religious question, but rather is trying to make claims about the meaning of evidence that does not agree with your beliefs. What

cells of the rubric address this issue? There are probably many, but certainly the intersection of “knowledge” and “conducting instruction” (e.g., you need to examine your knowledge of the subject). Also the intersection of “affect” and “interactions with students” would mark an intersection that might be addressed. The question that appears in this cell is intended to suggest one possible question that you might consider. There are others. Questions were only written for certain cells so as not to constrain your thinking.

Examine the table on the next page.

The general structure of the reflective journal should be constructed around the following rubric. This design is intended as a guide and may be modified as the semester progresses. There are numerous questions that might be asked in any given cell. You should think of questions for each cell.

<b>Rubric for Reflective Journal</b>			
	<b>Knowledge</b>	<b>Affect</b>	<b>Action</b>
<b>Planning</b>	<b>What do I need to learn before I teach this topic?</b>		<b>Is the advanced planning summary ready for next week?</b>
<b>Conducting Instruction</b>		<b>How did I communicate enthusiasm for this laboratory activity?</b>	
<b>Evaluating Instruction and Learning</b>	<b>How did I know that the students understand what I was teaching?</b>		<b>Why did I pick the specific topics for the test?</b>
<b>Professional Development</b>	<b>Where can I learn about new activities to help teach this topic?</b>		<b>Can I attend the meeting of the GSTA later this school year?</b>
<b>Interactions with Students</b>		<b>Why does Johnny not recognize that I am trying to help him?</b>	
<b>Interactions with Peers</b>	<b>What level of certification does my mentor teacher possess?</b>		<b>Did I remember to take the test questions to the biology teacher?</b>

The final section of the reflective journal will consist of a rationale paper. **Your rationale for science teaching paper should be constructed based on the criteria given below. It is to**

be typed, double spaced (approximately 12 pitch type) and about five or six pages in length. It should have contained at least the following items:

**A. Your reasons for teaching science;**

**B. A delineation of your goals for your science students and how these goals relate to the curricula that you plan to use;**

**C. A description of the learning environment you would like to provide for your students;**

**D. An account of the general types of science activities and interactions that you would like to see in the science classroom. Include teacher-student as well as student-student interactions. (Be as specific as possible.) Again, you must relate this to the science curricula that you plan to use.**

7. **Class participation and Attendance** - It is anticipated that every student will arrive at their designated classroom on time and attend every day. If you are unable to attend please contact an instructor or the school. Being absent without excuse for two days will result in the total loss of these points, as will being tardy without excuse on 4 occasions, or a combination of the two such as two tardies and one absence. Attendance will be checked daily. **10%** of grade.

Summary of Grading and Evaluation		
Name of Activity	Date Due	Percent of grade
How Can You Know/Skills laboratory	September 27	10%
Animations activity	October 25	10%
Instructional unit and resource file	November 8	15%
Mini-unit		25%
Show and tell/Drag and brag	December 6	10%
Reflective Journal	December 6	20%
Participation and attendance	every day	10%

## Special Note:

The University of Georgia's policy on Academic Honesty can be found in the UGA Student Handbook. It is in the interest of every student to be familiar with this policy. On most activities you may feel free to engage other students in discussion regarding the nature of material that they are producing relative to a given assignment. However, you must turn in for a grade only that work which is original to and/or created by you. On examinations and other activities that the instructor specifically excludes, you must not seek help in their completion.

The course syllabus provides a general plan for the course; deviations may be necessary.