

## ED 399: Secondary School Teaching - Science

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Additional Contact information: Please be advised that emails received after 4 PM may not be read before 9 AM the following day (Monday's following weekends). I will do my best to respond in a timely manner, however.

**Mission:** The Education Department complements Colorado College's expressed mission in that its goal is to provide the finest educational studies possible within the liberal arts tradition. We challenge students to "develop those habits of intellect and imagination that will prepare them for learning and leadership throughout their lives."

**Core Values:** As members of the Colorado College community and Education Department, we are committed to:

1. Honor the life of the mind as central focus of our common endeavor; specifically, we hope to contribute to the development of individuals who are able to engage in critical thinking about the issues and complexities of educational subjects.
2. Value all persons and seek to learn from them their diverse experiences and perspectives; specifically, we expect to promote an environment in which students engage in inquiry, are open to diverse perspectives, consider evidence as the bases of determining individual outlooks, and appreciate that alternative approaches to solving problems may offer value.
3. Practice intellectual honesty and live with integrity; specifically, we expect students to pursue their studies with scholarly, conscientious, and ethical effort. Encourage engagement and social responsibility; specifically, we hope that our students will contribute to the educational "life" of whatever community in which they live.

In light of our core values, the objectives:

### Objectives

1. Students will become familiar with creating a learning environment conducive to teaching secondary science.
2. Students will understand the purpose of secondary science teaching and how it might differ from the teaching of other subjects.
3. Students will apply their current understanding about student learning to secondary science teaching.
4. Students will become familiar with the latest technologies available for teaching science, including technologies to support constructivist instruction, technologies for laboratory data collection and analysis, and technologies for assessing student learning.

This course provides content necessary for secondary licensure in science.

### **General Information**

The class will meet Monday, Wednesday, and Thursday afternoon from 1:30pm to 4:00 pm (Barnes 116) and Friday morning from 8:00 AM to 10:30 AM. Please be prompt and pay special attention to the schedule of course sessions, readings, etc.

The purpose of this course is to intellectualize the teaching process by requiring you to reflect upon effective science education for all students. The intent is to tie current research in the field of science education to actual classroom practice. Current learning theories provide the lens through which the traditional view of teaching will be critically examined and expanded. In doing so, you will become aquatinted with the specific methods of and materials for teaching science. Moreover, you are encouraged and challenged to reflect and apply ideas/topics discussed in the course to the science classroom.

Research has shown that exemplary teachers possess the ability to accurately assess their teaching. Consequently, a goal of this course is to enable you with the tools and knowledge necessary to effectively examine your teaching. This requires you to participate fully in class and reflect extensively about the desired state of science education in the classroom.

### **School placements**

Field placements will continue at your respective schools (unless otherwise noted). School placements are a vital part of this course. You will be encouraged, challenged, and at times required to draw on your experiences in the classroom.

### **Readings**

There is no specific text for this course. However, you will be asked to reflect on selected readings from peer-review journals and authoritative texts.

You should complete all assigned readings by the deadline. Class structure largely depends on your contributions. At times we will not discuss the readings directly, but your journal should provide evidence that you have completed the readings and have integrating them into your developing picture of teaching and learning.

### **Absenteeism**

Societies need excellent teachers with a passion for helping children mature and succeed in a complex world. Missing a single day of class is as serious as missing a day of teaching. You are expected to be punctual and regularly attend class. If an emergency arises, you must report your absence immediately. Make up work for an excused absence consists of a journal quality paper, complete with in-depth supportive literature review.

### **Grading**

Research has shown that competitive grading can sabotage the learning environment. Grading for this course is based on a modified contract system. You will select the level for which you wish to work. But, note the consequences to your participation in the program if you earn less than a B-. I expect all of you to complete work at the level of a B or higher. Work must be

exemplary in order to earn the grade of “A.” Any assignment that does not meet the “very good” standard *may be* (but not necessarily, as I don’t want to grade twice) returned for modification. *Minimum* requirements for the grades are as follows (subject to change):

For a grade of a C:	<ul style="list-style-type: none"> <li>• Attend class regularly</li> <li>• Participate in discussions</li> <li>• Complete readings as assigned</li> <li>• Complete daily assignments</li> <li>• Keep and turn in all journal assignments</li> <li>• Satisfactorily conduct one microteaching assignment</li> <li>• Complete <u>one</u> SATIC analysis of your teaching (requires audio/video of your teaching)</li> </ul>
For the grade of a B:	<ul style="list-style-type: none"> <li>• All of the above, and:</li> <li>• Read, summarize, and present two peer-review articles about research on learning</li> <li>• Satisfactorily conduct 2 microteaching assignments</li> <li>• Participate in the Share Fest</li> <li>• Modify <u>one</u> lab or activity of your choice</li> </ul>
For the grade of an A:	<ul style="list-style-type: none"> <li>• All of the above and:</li> <li>• Report on the effectiveness of your lab or activity modification (implies that you actually taught the modified activity)</li> <li>• Satisfactorily conduct 3 microteaching assignments</li> <li>• Prepare a module on the topic of your choice <u>or</u> redesign a chapter you will be teaching</li> <li>• Complete <u>two</u> SATIC analyses of your teaching and reflection on growth.</li> </ul>

### **Explanation of Assignments**

#### **Journal**

The journal is not a daily log or diary of events in the classroom. Rather, this journal should describe and reflect what occurs in the course, field placement, seminars, and the interaction of all experiences. By the end of the course, the journal will refine your philosophy of teaching and learning. In general, you should write a full page a day. Remember; we may not have time to directly discuss every reading assignment, but your journal should provide ample evidence that you have completed the readings and are integrating them into your teaching philosophy.

**Journals are collected each Thursday.**

#### **Microteaching**

You will be asked to microteach three lessons, as outline below. My recommendation is that you maintain the same topic/theme for each lesson. This will allow your peers to gage your planning strategies from engaging the student to assessing learning.

- One lesson on motivating/engaging the learner
- One lesson on a “lab-based” activity (can be done in conjunction with the modified science lab assignment)
- One lesson on performance assessment

#### **Self –Evaluation of Classroom Teaching**

You will conduct at least one SATIC analysis of your teaching. *SATIC is a verbal behavior analysis that focuses on the types of questions asked and response patterns used when interacting with students.* You must submit a video/audio tape that clearly captures your interactions you’re your students. Prior to taping, you should obtain permission from your cooperating teacher and/or principal. (A videotape of you teaching also provides insights into your non-verbal behavior; and thus, a more valuable tool for assessing your teaching delivery.

**For the SATIC analysis, you must select a continuous 15-minute section of your taped teaching and submit a quantitative assessment.**

### Share Fest

Most teachers have small budgets for classroom supplies, particularly laboratory supplies. For this assignment, you are asked to create a list of ten items, complete with directions on how to obtain each item, plus a couple of statements describing how the item will be used to “teach science.” Be prepared to “show and tell” three items during our Share Fest.

### Article Reviews

Research has shown that exemplary teachers utilize professional journals. Consequently, you are to read, complete a one-page summary/review, and orally present on journal articles specific to science education: *The Science Teacher*, *Science Scope*, *The Biology Teacher*, *Journal of Research in Science Teaching*, *School Science and Mathematics*, or *Science Education*. (There are many other journal titles available – this is just a short list. If you choose an article from a journal not listed, make sure the journal is *peer-reviewed*.)

### Modified Science Lab or Activity

“Curriculum” is not a collection of materials from which you teach. Rather, curriculum encompasses what you *do with the materials in order to facilitate learning*. Also, many of the labs and activities found in science textbooks and other sources do not reflect current research based ideas of teaching and learning. Most of these materials were published for marketing purposes. Consequently, in order for learning to occur the teacher must modify many of these. You will select a science laboratory or activity of your choice to modify. The modifications must reflect current ideas regarding effective teaching and learning. A write-up must be submitted that includes student goals and objectives, a rationale for modifying the activity, how learning theory and learning styles are reflected in the modifications, and the strategies used to assess student understanding. For exemplary work, select an activity or lab that you will be teaching in your placement school during block 2. After teaching the activity, reflect on the modifications you made and present anecdotal evidence to support additional refinement.

### Module or Redesigned Chapter

#### *Module*

Prepare a module of your choice. Use lessons you will be using in your classes during student teaching. The module should include at least one lab or activity, one discussion, one demonstration, and one lecture. There must be a minimum of five lessons, and the lessons should reflect you and your work. They must be quality lessons, not just “stuff” thrown together. The module should integrate the ideas and concepts presented and/or discussed in class. The module should begin with a three to four page statement of your teaching philosophy. This philosophy should include; (1) student goals and student actions, (2) how the module is structured and why, (3) how the module reflects knowledge about teaching and learning, how the module accounts for exceptional students, (4) how learning styles are taken into account, and (5) how the module’s assessments reflect what is known about teaching and learning. Note: The module can easily be modified to become part of your *required* Teacher Work Sample (due during student teaching).

### *Redesigned Textbook Chapter\**

Select a chapter out of the science textbook you will be using as a student teacher. Redesign this chapter so that it follows the same guidelines as the module. Guidelines will be presented in class.

\*Consult with your cooperating teachers regarding the design of your chapter. Check with your department to learn about the latitude you will have when teaching the module or chapter. I would like to know your decision by Friday, Oct. 6, concerning this assignment.

### Summary of Assignments and Due Dates

October 4: Assigned Reading from Gregory Derry (Journal Entry required)

October 5: Reading on *Learning for Use* (Journal entry required)

October 9: One page, single-spaced summary on peer-reviewed article (Handed in separately)

October 11: Microteaching (10 minutes): motivating/engaging the learner (Lesson plan handed in separately)

October 13: Share Fair (list handed in separately)

October 18: Microteaching (15 minutes): lab-based activity (Does not have to be a traditional “wet” lab)

October 18: Modified lab/activity due

October 19: First STATIC Analysis due

October 23: Microteaching (15 minutes): performance assessment activity

October 25: Module or chapter redesign due; Second STATIC analysis due

Teaching is a complex profession. Teaching is incredibly difficult and demanding, yet enjoyable and fulfilling. I have high expectations for you. Six years from now, I hope you will become the master teacher in your school. I am here to help you become an effective teacher with a passion for teaching. During this course, we as a collective group will learn a great deal about ourselves and about teaching and learning. I look forward to an enjoyable and rewarding experience.

This is a reminder that the CC Honor Code applies to all academic work in this course. The Honor Code also covers rules for your Masters Research Paper. The Code is based on trust and maturity and reflects the academic attitude of the Colorado College community.

In a group (in class and outside of class) discussion and help between students is always encouraged. Remember, however, that dependence on others to come up with answers in these situations will not equip you handle material in class or on your Masters Research Paper. Conducting authoritative, primary work is critical, but often requires assistance when difficulties arise. You are encouraged to seek assistance to the extent that such help does not violate the Honor Code. If you have any questions about the Honor Code or how it might apply in a particular situation, seek clarification from the course instructor or member of the Honor Council.

### **Tentative Schedule (First two weeks)**

(Below is a rather detailed outline of proposed activities. However, your specific needs will drive decisions about what is covered during class)

### October 2

- Course overview
- *Discussion*: What is our *number one* task as a secondary science teacher?
- Activity: What is on the bottom of the cube?
- Activity: Phases of the moon
- Reading (**Due October 4**): Prologue, Introduction, and Chapters 1 and 2 from What is Science and How it Works, by Gregory Derry.
- Reading on a peer review article of your choice, which must be related to science teaching, but does not have to be in your content area (1 page summary **DUE October 9**).
- Announcements
  - CAST conference, November 16-17  
([http://www.mines.edu/Outreach/Cont\\_Ed/cast/cast99c.htm](http://www.mines.edu/Outreach/Cont_Ed/cast/cast99c.htm))

### October 3

- Seminar
- General Methods until 5:30 PM

### October 4

- *Discussion*: What is Science, and How does it work?
- *Discussion*: What is inquiry?
  - Examine the Benchmarks for Scientific Literacy
  - Examine Inquiry and the National Science Education Standards
- Planning for your courses, units, and lessons – Writing measurable objectives

*A well-planned, active learning environment will be free of major discipline issues and provide you with the best teaching experience. Teachers who put in the effort are always greatly rewarded.*

- Activity: The Water Cycle
  - Where's all the water?
  - Concept mapping the water cycle
  - <http://www.coloradocollege.edu/dept/ed/facultyandstaff/taber/WaterCycleActivity/HYDRO.html>
- Reading (**DUE October 5**): *Learning for Use* by Danny Edelson

### October 5 (Done on Oct 9 due to absence on Oct 5)

- *Discussion*: LFU
- *Discussion*: 5Es and the learning cycle lesson/curriculum design model
- ABCs of Assessment
- *Discussion* – how would you grade concept maps?
  - What is valuable about the Water Cycle of assignment?
  - Where would this activity fall in the LFU model?
  - What other ways could you use the web for learning?
    - DLESE website ([www.dlese.org](http://www.dlese.org))
    - DNS lookup (<http://www.dnsstuff.com/>)
- Activity: Planning your course, unit, and lesson

- PlanningScales.doc and BloomKeywords.doc handouts
- (DID not do this) Activity on another “motivate” example: Thinking about temperature
  - Blank maps and crayons
- Collect Journals
- Handout: SATIC Analysis

October 6 (NO CLASS – MIKE AT MEETING IN DENVER)

October 9 (In Mierow Computer Lab)

- Activity: Additional teaching strategies:
  - <http://enhancinged.wgbh.org/research/additional.html>
  - Develop ideas for a few
- Discussion: Share your one page, single-spaced summary on a peer-reviewed article
- Homework: Freebies – Share Fare (**DUE October 13**).

October 10

- Seminar
- General Methods until 5:30 PM

October 11

- Microteaching: Motivating/Engaging the learner. Present a 10-minute lesson.
- Problem Based Learning (PBL)
  - Medical training story
  - Handout from Illinois Math and Science Academy  
([www2.imsa.edu/programs/bln/model.php](http://www2.imsa.edu/programs/bln/model.php))
- *Discussion*: Teacher Work Sample/Module design
  - Common components of design modules (handout)
  - Shared variations of classroom inquiry (handout)
  - Planning scales and Blooms keywords

October 12

- Activity:
- Continue Planning Scales: Planning your Teacher Work Sample
- Activity: Grading
  - ABCs of Assessment (PowerPoint)
  - Writing good assessment questions
  - PALS from SRI (handout)
  - How would you grade concept maps?
- Activity and Discussion on Integrating *Math*: Moving from “motivate” to building knowledge (Boiling Water Experiment) – at Mierow

October 13

- Catch up time

A handout describing remaining class activities will be given prior to the completion of week 2.