SCIENCE EDUCATION 491
Fall 2009

Deborah Donovan, Biology 310
650-7251 *donovan@biol.wwu.edu*
office hours: MT 1:00-2:30, or by appt.

Don Burgess, SL 250C
650-2482 *don.burgess@wwu.edu*
office hours: TR 2:30-4:00 by appointment

The web site for the course is http://fire.biol.wwu.edu/donovan/SciEd491/SciEd_491.html

---

Science Education 491 is the second of the two science methods courses (Sced 481 is a pre-requisite). The course blends content, process and instructional methods appropriate for grades 7-12.

Goals

The major goals of this course are: (1) to further develop an understanding of the national and state standards for science education; (2) to design or adapt and test a sequence of science lessons appropriate to address those standards in the secondary classroom; (3) to gain practical experience with teaching and learning science through inquiry methods; (4) to gain a deeper understanding of assessing for student understanding in science; (5) to begin to become collaborative professional science educators.

These goals will be accomplished in a variety of ways including: (1) demonstration units presented in class; (2) collaborative preparation and presentation of science lessons; (3) class discussions on readings/issues related to science instruction, e.g., processes of science, teaching evolution, safety considerations, etc.; (4) review of the *EALR's* and *GLE's* for the state of Washington and the *National Science Education Standards*, *Benchmarks* and *Curriculum Topic Study*; (5) reflective participation in model lessons.

"Texts"

Although there are no "textbooks" in the traditional sense for this course, there are four you should obtain: *Everyday Assessment in the Science Classroom* (NSTA Press 2003); *Teaching High School Science Through Inquiry* (National Academy Press 2005); *Making Sense of Secondary Science: Research into Children's Ideas* (Driver *et al*., 1994); *How People Learn: Bridging Research and Practice*, (National Academy Press, 1999). You may already have the last three of these if you took Sced 481. There are other books and readings that you will be required to use in the course; they will be available online on the course web site or in the LRC. Refer to the class schedule for reading assignment and discussion dates. Nearly all of the reading assignments will be tied to a discussion and each of you will lead one of the discussions (see Leading a Discussion below).

Assignments

Educators need to have three kinds of knowledge to function effectively in the classroom:

- Content knowledge—an understanding of the subject area to be taught. You are getting this through your academic major.
- Pedagogical knowledge—an understanding of how people learn and how to teach. We will work on this in 491, but you have been covering this in your classes in Woodring.
- Pedagogical content knowledge—the major point to this course. What are the specific issues that are unique to teaching science? How is teaching science different from teaching art? You have already begun thinking about this in Sced 481.

To demonstrate your preparation in all these areas you will need to demonstrate the ability to plan lessons, implement at least portions of a lesson, and be reflective about your own practice. You will have the opportunity to demonstrate these skills through a variety of assignments listed below.

Short "unit" plan
A major outcome of this course will be the development and presentation of an extended set of science lessons that include all of the fundamental components for effective science teaching. These will be discussed and modeled at length during the course. The collaborative lessons must be done in teams of three. The idea is that you select one big idea and outline in detail 3-5 cohesive lessons that address that idea. At the end of the quarter, you will present your lessons to the class and walk the class through a portion of one of your activities. You will be required to turn in two copies of your lessons, one for grading and one for reserve for other students. Draft portions of the unit plans will be due throughout the quarter. Consult the course schedule for these dates.

Classroom Demonstration
Every student in the class will be required to set up and perform a science demonstration to the rest of the class sometime during the quarter. You will need to give a brief introduction to your demo, which must be accompanied by handouts for each person and instructor in the class. The handouts must include a very detailed explanation of the demo, including materials needed, procedures, and safety concerns.

Leading a Discussion
You will be responsible for leading one discussion during the quarter. This leadership will be done in small groups (2-3 students). It is your responsibility to do the reading and formulate focus questions based on both your and your classmates' ideas. You need to come to class on your assigned day prepared.

Reflective Paper
At the end of the quarter, you will write a short (3-5 page) reflective essay discussing your progress in this course and towards becoming a science teacher.

PET Lesson
This lesson provides an opportunity to gain first-hand experience with a research-based curriculum. It also provides an opportunity to explore the use of computer-based probeware in a teaching/learning environment.

Marine Research Project
To give you experience with open-ended inquiry, you will conduct a short research project using organisms found in the marine intertidal zone. This project can be field- or lab-based.

Geology Jigsaw Lesson
You will gain first-hand experience using an inquiry-based geology activity developed at WWU. This activity will build upon lessons learned from the PET experience and illustrate how jigsawing is a powerful teaching/learning technique.

Given where you are in your educational career, the expectation is that you will conduct yourself in a professional manner. The expectation is that you will complete all assignments, attend all class meetings, and be an active contributor to the class. The success of this class depends on you. If you are an active participant, and do high quality work in each of the categories below, you will receive full credit. Obviously, poor/late attendance, poor participation in activities and discussion, and low quality work will result in less than full credit. At any time you are concerned about your performance, please ask you instructors. Your instructors will inform you when they feel that there is a problem as well.

- (20 %) Class attendance and participation. **We place a very high premium on showing up on time and having class start on time.** You are expected to attend every class session and to participate in the discussions. If you must be absent you must let us know in advance.
- (50 %) Preparation and presentation of collaborative unit lessons
- (10 %) Reflective paper
- (10 %) Classroom demonstration
- (10 %) Leading a discussion

SCED 491-Fall 2009

	Week 1 – Sept. 23 *Introductions and icebreakers; Logistics of class.*	Week 1 – Sept. 25 *Teaching science and the nature of science* **Disc: How People Learn Ch 2; Alberts, Inquiring into Inquiry pp. 3-13 (on web).** **DEMO INTRO**
Week 2 – Sept. 28 *Metacognition* **Disc: White and Frederiksen, Inquiring into Inquiry pp. 331-370 (on web).**	Week 2 – Sept. 30 *Science notebooks* **Unit topics due** **DEMO #1**	Week 2 – Oct. 2 *Natural Selection – Model Lessons* **Begin work on Concept Map of Unit** **DEMO #2**
Week 3 – Oct. 5 *Natural Selection – Model Lessons* **DEMO #3** **Disc: Schwartz et al. Depth vs. Breadth (on web)**	Week 3 – Oct. 7 *Teaching about Evolution* **DEMO #4** **Concept Map Due**	Week 3 – Oct. 9 *Teaching about Evolution* **Disc: Teaching about Evolution and the Nature of Science Ch. 1 & 5 (on web); Antolin article (on web)**
Week 4 – Oct. 12 *Teaching with Technology* *PET Cycle 1* **DEMO #5**	Week 4 – Oct. 14 *Teaching with Technology* *PET Cycle 1* **DEMO #6**	Week 4 – Oct. 16 *Teaching with Technology* **Disc. Teaching high school science through inquiry Ch. 7**
Week 5 – Oct. 19 *Assessment: Pre-assessments* **DEMO #7**	Week 5 – Oct. 21 *Assessment: Formative Assessment* **Discussion: Everyday Assessment Ch 2 & 5**	Week 5 – Oct. 23 *Assessment: Summative Assessments* **Submit draft of unit assessments** **DEMO #8**
Week 6 – Oct. 26 *Teaching with Kits: Properties of Matter* **DEMO #9**	Week 6 – Oct. 28 *Teaching with Kits: Properties of Matter* **DEMO #10**	Week 6 – Oct. 30 *Teaching with Kits*
Week 7 – Nov. 2 *Teaching with Conceptual Models* **Submit draft of Unit Calendar**	Week 7 – Nov. 4 *Lab safety* **DEMO #11**	Week 7 – Nov. 6 *Environmental Education* **Disc. Reading to be announced.**
Week 8 – Nov. 9 *Open-ended Inquiry – Marine science* **DEMO #12**	Week 8 – Nov. 11 ***Holiday – Veteran's Day***	Week 8 – Nov. 13 *Open-ended Inquiry – Marine science*
Week 9 – Nov. 16 *Open-ended Inquiry – Marine science* ***Student symposium***	Week 9 – Nov. 18 *Guided Inquiry- Discovering Plate Boundaries Jigsaw* **DEMO #13**	Week 9 – Nov. 20 *DPB Jigsaw*
Week 10 – Nov. 23 *DPB Jigsaw*	Week 10 – Nov. 25 **Thanksgiving Holiday**	Week 10 – Nov. 27 **Thanksgiving Holiday**
Week 11 – Nov. 30 *Inquiry Wrap-up;* **Disc: Everyday assessment Ch 4; Teaching high school science Ch. 8**	Week 11 – Dec. 2 Unit lesson presentations	Week 11 – Dec. 4 Unit lesson presentations