

SCIENCE EDUCATION 481
Winter 2009

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Course Description:

The main purpose of this course is to introduce prospective science teachers to key ideas associated with teaching science at the secondary level. Teaching science effectively requires that teachers attend to the prior ideas that students bring with them into the classroom, that teachers provide experiences that allow students to construct their own knowledge, and that teachers pay careful attention to state and national guidelines about what needs to be taught. This course will introduce you to these fundamentals as a foundation for your professional education program including methods courses and teaching practica.

This introductory course is closely aligned with the Secondary Science Methods course SCED 491. In the present course, we will mostly discuss the fundamental ideas behind teaching science. All of the topics we cover will be developed in more detail in SCED 491 where we will also cover more of the “nuts-and-bolts” of teaching science (managing labs, practicing inquiry, doing demos, science assessment, etc.).

The format of the course is a mixture of lecture/lab activity and discussion. During the first hour of the class, you will participate in an activity centered around that day’s topic. The second hour of the class will be devoted to a discussion of the readings for that day. It is imperative that you come to class having done the readings.

Texts:

Although there are no “textbooks” in the traditional sense for this course, there are three books you should obtain:

- *How People Learn: Bridging Research and Practice* (National Academy Press, 1999)
- *Teaching High School Science Through Inquiry* (Llewellyn, 2004; Corbin Press)
- *Making Sense of Secondary Science: Research into Children’s Ideas* (Driver et al., 1994)

You also need to become familiar with state and national science standards. There are several copies available in the Learning Resource Center (LRC) and they are also available online. Throughout the quarter, readings will be assigned from these books and from other materials, all of which will be linked to the web page. Each of the reading assignments will be tied to a discussion. These books will be used again in SCED 491.

Prerequisites: 12 credits of Natural Science

Course Outcomes and Goals:

The major goals of this course are (1) to develop an understanding of the nature of science, (2) to explore current research on how people learn, (3) to become acquainted with the Essential Learnings of Washington State and the National Science Education Standards and their roles, and (4) to become familiar with documents on reformed science teaching.

These goals will be accomplished in a variety of ways including: (1) exploring and adapting a science lesson appropriate within the 7-12 grade range that incorporates all the key elements of effective science teaching, (2) class discussions on issues related to science instruction, e.g., processes of science, constructivism, etc., (3) review and application of the *Essential Academic Learning Requirements* for the state of Washington and the *National Science Education Standards*, (4) becoming aware of professional organizations for science teachers, and (5) review of existing science curricula.

Assignments and Assessments:

You will have a number of different assignments over the quarter. Most are due one week after they are assigned. You are welcome to revise any of the assignments for full credit.

Standards Assignment (10%): You will explore state and national standards for you topic of choice and analyze the similarities and differences between the different standard documents. It is due the week after it is assigned.

Concept Map (10%): You will construct a concept map about a topic of your choice. This topic will be the focus of several assignments in this course. It is due the week after it is assigned.

Preconceptions (10%): You will use three sources to identify common prior ideas for a topic of your choice. It is due the week after it is assigned.

Preassessment Probe (10%): You will develop a probe that assesses for common prior ideas for a topic of your choice. It is due the week after it is assigned.

Lesson Revision (20%): You will find one standard lesson on your topic and revise it to address the important aspects of teaching science. It is due the day of our scheduled final.

Reflective Paper (20%): You will write a reflective essay in this class. This meant to be a broad essay about the teaching of science and should be 3-5 pages long, double-spaced, using 12 point font. It is due the day of our scheduled final.

Discussion Questions (20%): You are responsible for submitting questions or points for discussion to me before each discussion. These questions must be given to me at the *beginning* of each class.

Grading:

95% - 100%	A	80% - 82%	B-
90% - 94%	A-	77% - 79%	C+
87% - 89%	B+	72% - 76%	C
83% - 86%	B	70% - 71%	C-

Course Relationship to Teacher Preparation Standards:

Content Pedagogy: *The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and can create meaningful experiences that make these aspects of subject matter meaningful to students.*

Diverse Learners: *The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.*

Communication and Technology: *The teacher-in-training uses knowledge of effective verbal, nonverbal and media communication techniques to foster active inquiry, collaboration and supportive interaction in the classroom.*

Planning: *The teacher plans instruction based upon knowledge of subject matter, students, the community, and curriculum goals.*

When	Topic	Reading Assignment	Assignments Due
WEEK 1	Nature of Science		
WEEK 2	Nature of Science	AAAS Science for All Americans Ch. 1 & 12 (http://www.project2061.org/publications/sfaa/online/sfaatoc.htm)	
WEEK 3	Constructivism	<i>How People Learn</i> Chapters 1 & 2	
WEEK 4	Science Standards – National and State	National Science Education Standards Overview pp. 1-3 and Ch. 1 (http://www.nap.edu/catalog.php?record_id=4962#toc) Project 2061 Benchmarks Introduction (http://www.project2061.org/publications/bsl/online/bolintro.htm)	Choose topic for assignments (this will be done in class)
WEEK 5	Prior Ideas	<i>Making Sense of Secondary Science</i> (Driver et al.) Introduction + Chapter of your choice	Standards Assignment
WEEK 6	Curriculum Topic Study – Formative Assessment	<i>Science Curriculum Topic Study</i> (Keeley) Ch. 1, Vignette #2 (pp. 92-95), Vignette #7 (pp. 104-105) (this book is in the LRC and I will have a photocopy of the reading outside my office)	Preconceptions Assignment
WEEK 7	Big Ideas in Science – Concept mapping	Project 2061 Designs for Scientific Literacy Ch. 7 – Unburdening the Curriculum (there is a link to this on our web page)	Probe
WEEK 8	Inquiry	<i>Teaching High School Science Through Inquiry</i> (Llwellyn) Ch. 1, 3, & 4	Concept Map
WEEK 9	Inquiry	<i>Teaching High School Science Through Inquiry</i> (Llwellyn) Ch. 5 & 6	
WEEK 10	Teaching Science	Taking Science to School (Ch. 1 & 2) (http://www.nap.edu/catalog.php?record_id=11625)	
Final			Lesson Revision Reflective Essay

