

INVESTIGATIVE SCIENCE

SCED 294, Spring 2008

Instructor: Dr. Emily Borda **Email:** emily.borda@wwu.edu

Office: CB 242 **Phone:** Ext 3135 (650-3135 from off-campus)

Office Hours: M 1 - 3, W 3:30 - 4:30, or by appointment

Course Prerequisites: Completion of 3 natural science GUR's.

Learning Objectives: After this course, the successful student will:

- Have a beginning understanding of how scientific knowledge is generated and used, and begin to fathom its power as well as its limitations.
- Be able to ask and answer a simple scientific question.
- Have a greater understanding of what matter is composed of and how it behaves.

Structure of the course: This course will have two major components: A) A content strand; and B) A nature of science (NOS) strand. The content strand will be focused on the major ideas of chemistry. In this strand, students will engage in inquiry activities around basic chemical concepts. The NOS strand will happen concurrently with the content strand and is meant to help students understand the basic tenets and processes of science. The guided inquiry activities in the content strand will become less structured throughout the course so that students will be asked to engage in more and more scientific processes as the quarter progresses. The course will end with a capstone experience in which students design and carry out a small research project in groups. Students will present their research projects in a mini-conference at the end of the quarter.

Required Texts:

- Carey, Stephen S. *A Beginner's Guide to Scientific Method*, third ed. Thomson, 2004.
- Wynn, Charles M., Wiggins, Arthur W. *The Five Biggest Ideas in Science*. Wiley, 1997.
- Supplementary readings will be assigned periodically. They will be posted on Blackboard as needed.

ASSIGNMENTS

Readings and journal entries: Readings will frequently be assigned. Reflection questions will be posted to help guide you in doing the readings and to help you prepare for discussions. You will turn in written responses to these questions using the blog tool on the course's Blackboard site. Note that to stimulate original thought, you will not be able to see your classmates' responses until after the case study is due. Journal entries are graded on completion only. There is no length requirement for these entries, but the T.A. and instructor will read and respond to them periodically. If there is little or no substance to respond to in your journal entries, we reserve the right to give partial or no credit. However, points will not be taken off for spelling or grammar.

Homework: There will be several homework assignments based on the chemistry content of the course. These are essential in giving me an idea of your learning progress. They will be graded based on completion and feedback will be given based on your responses.

Exams: Make-up exams are not given, so you must make every effort to take exams when they are scheduled. If there is a serious problem (e.g., medical reason), contact me in advance or as soon as possible. Missed exams carry a grade of 0. The exam dates are April 25 and May 23. The exams will cover class activities, homework, assigned readings and class discussions.

Group Project: Each student will be required to work in a group to develop a research question and an investigation to answer that question. Students will present their research projects during the time slotted for the final exam on Tuesday, June 10, 1-3 PM.

POLICIES AND PROCEDURES

Blackboard: Most of the course resources will be posted on the Blackboard Learning System (<http://courses.wvu.edu/>). If you have registered for this class, you will automatically be able to access these resources. If you have limited internet access or are unfamiliar with Blackboard, please talk to me.

Late arrivals: Due to the collaborative nature of this class it is imperative that everyone arrives to class on time and ready to go at 1:00 PM. Late arrivals are unacceptable and will negatively impact your grade. Each time you are late to class, points will be deducted from your attendance grade. Chronic lateness will result in a loss of 10% of the points for the class. You must call/email in advance and/or have a valid emergency for a late arrival to be excused.

Missing a Class: Since this is a hands-on, collaborative, inquiry based class, a missed class cannot simply be made up by getting the notes from a classmate or the instructor. Because of this, attendance is required unless you have a valid excuse *and* have communicated with the instructor (via phone or email) PRIOR to class. Each unexcused absence will result in the deduction of 2% of the total points of the class to a maximum of 10%. Only WWU approved activities and emergencies are acceptable excuses for missing class.

Academic Integrity: Cheating, plagiarism, etc., will not be tolerated. All work you submit for the course should be your own. Students who cheat or plagiarize, or who knowingly help another to cheat will receive a minimum of zero on that assignment and may fail the course. If you are unsure if a specific action constitutes cheating or plagiarism you should ask the instructor.

Participation: As in inquiry-based class, you will be developing your own understanding of the material through the lab experiences, and as such, must be engaged, questioning and contributing to the group for success. Therefore, participation is a key element in this course and in the final grade. Periodically, you will be evaluating your group and yourself each week, as well as doing a reflective evaluation of your learning at the end of each cycle and at the end of the course. In order to receive full credit for participation, complete and up-to-date workbooks are required.

Your participation grade will be based on:

- Participation in discussions
- Completion of surveys and handouts
- Up-to-date and complete workbook during course

Evaluation: Your final grade will be based on the following components:

Attendance/punctuality	10%	The following scale will determine grades:
Participation	15%	
Homework	15%	
Journal entries	15%	
Exams	20%	
Group project	25%	

If your average is borderline between two grades and/or close to a break point, the instructor will have the discretion to use your participation and progress in the course as the deciding factor to determine your final grade, including plus and minus grade assignments.

Tentative Course schedule

TUES	THURS	FRI
4/1 Introduction to SCED 294 Discussion: Teaching and learning through inquiry; norms Activity 1: What is matter? HW: Act. 1 HW; NOS Preassessment (Due 5 PM Wed.)	4/3 CCI Preassessment Activity 2: Mental models of matter Discussion: What is science?; The nature of evidence HW: Carey Chap. 1; Propose questions for scientists	4/4 Act. 2 cont'd Discussion: Questions for scientists Panel of scientists Rdg: "Ten Myths of Science" (Bb); Act. 2 HW
4/8 Activity 3: The particle model of matter Discussion: Ten Myths paper; panel of scientists HW: SFAA Chap. 1 (Online); Act. 3 HW	4/10 Activity 4: Atomic structure Discussion: NOS in the curriculum HW: Carey Chap. 2; Act. 4 HW	4/11 Discussion: Atomic Structure Activity 5: Motion of small particles Discussion: inference vs. observation HW: Wynn/Wiggins Chap. 2
4/15 Activity 5 cont'd HW: Act. 5 HW	4/17 Activity 6: Small particles in gases HW: Carey Chap. 3	4/18 Activity 6 cont'd Discussion: Proposing explanations HW: Act. 6 HW
4/22 Pulling it all together: Properties of gases HW: Carey Chap. 4	4/24 Discussion: Experiments Activity 7: Forces between small particles Review for exam HW: Act. 7 Plan improved experiment	4/25 Exam #1 Activity 7 cont'd HW: Reflection on experiment
4/29 Presentation of Act. 7 experiments Activity 7 cont'd Activity 8: Phase changes in water HW: Act. 7 HW, PCB paper	5/1 Activity 8 cont'd Discussion: Correlational studies vs. experiments HW: Act. 8 HW	5/2 Pulling it all together: Solids, liquids & gases Activity 9: Solutions HW: Science Matters pp. 94-99; Design Act. 9 experiment
5/6 Activity 9 cont'd HW: Act. 9 HW	5/8 Activity 10: Classification of elements HW: Wynn/Wiggins Chap. 3; Act. 10 HW	5/9 Discussion: The Periodic Table Activity 11: Chemical bonding
5/13 Activity 11 cont'd HW: Act. 11 HW	5/15 Pulling it all together: Chemical bonding Activity 12: What happens during a chemical reaction? HW: Science Matters pp. 75-80	5/16 Activity 12 cont'd Activity 13: What happens to atoms and molecules during a chemical reaction? HW: Act. 12 HW
5/20 Activity 13, cont'd Pulling it all together: Intermolecular forces and chemical bonds HW: Act. 13 HW	5/22 Review for exam	5/23 Exam #2 CCI Postassessment
5/27 <u>Group projects:</u> Observe systems, Brainstorm research questions Rdg: Research questions (Bb)	5/29 Discussion: Research questions <u>Group projects:</u> Propose & critique questions HW: Start designing experiment(s)	5/30 <u>Group projects:</u> Propose & critique experiments
6/3 <u>Group projects:</u> Conduct experiments HW: Critique & redesign experiments	6/5 <u>Group projects:</u> Redesign & conduct experiments HW: Analyze data	6/6 <u>Group projects:</u> Begin developing presentation HW: Reflections on group project; NOS postassessment
6/10 Mini-conference, 1-3 PM		