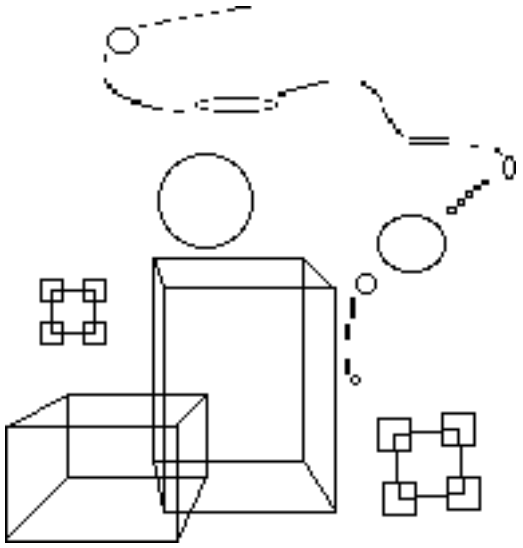

EDCI 424 The Teaching of Earth/Physical Science in the Secondary Schools

CHM 502 Modern Methods of Teaching High School Chemistry

Fall 2008

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Teaching Assistant:	Phil McLaury 494-5312	216 WTHR rmclaury@purdue.edu
Office Hours:	by appointment	
Classes:	Monday 2:30 - 5:20 Lab section 2164 BRWN	Thursday 1:30 - 3:20 Lecture section 420 WTHR
Textbook:	There is no required text; a packet of readings is available from Copy Mat. Readings from the *National Science Education Standards*, can be downloaded from http://www.nap.edu/readingroom/books/nses/html.	
Supplies:	You may need a ***three-ring binder*** to contain the activities, readings, and lesson plans that will be developed during the semester. Journals will be submitted by email.	
NSTA:	Information for joining the National Science Teachers' Association, the major professional organization for pre-college science teachers, will be provided in class. Membership includes a subscription to *The Science Teacher*.	

Adaptive Programs: Students with disabilities must be registered with Adaptive Programs in the Office of the Dean of Students before classroom accommodations can be provided. If you are eligible for academic accommodations because you have a documented disability that will impact your work in this class, please schedule an appointment with me as soon as possible to discuss your needs.

Emergencies: In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Here are ways to get information about changes in this course: my email address, mnakhleh@purdue.edu, and my office phone, 494-5314.

Academic Dishonesty: Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, <http://www.purdue.edu/univregs/>University Regulations] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972].

Class Attendance: Purdue University policy states that all students are expected to be present for every meeting of classes in which they are enrolled. All matters relative to attendance, including the make-up of missed work, are to be arranged between you and the instructor. Only the instructor can excuse you from classes or course responsibilities. In the case of an illness, accident, or an emergency**,** you should make direct contact with your instructor as soon as possible, preferably before the class. If the instructor cannot be reached directly a message should be left in the instructor's department mailbox or with the instructor's secretary. If you will be absent for more than five days, have not been able to reach the instructor in person or by telephone or through leaving notification of your circumstances with the instructor's secretary, you or your representative should notify the Office of the Dean of Students (765-494-1254) as soon as possible after becoming aware that the absence is necessary. Be advised, you may be asked to provide documentation from an authorized professional or agency that supports an explanation for your absence

Cross-listed Courses This class is listed under a variety of options: EDCI 424, CHM 502, & PHYS 590. This is done to accommodate the requirements of the different programs in which you may be involved, whether bachelor's or master's degrees or the Transition to Teaching Program. Anyone enrolled in a 500

level course or above, must complete a separate course project to satisfy Graduate School requirements.

About me

I started my professional career as an industrial chemist in Washington D.C. When we moved to Maryland, I taught life science, earth science, and math to 7th and 8th graders in middle school for three years, and then I became a high school teacher of chemistry, physical science, and computer science for 12 years. I became very interested in misconceptions and the problems of teaching and learning chemistry and completed master's and doctoral degrees in chemical education in 1990. I hope that my experiences will be useful to you as you work to build your teaching expertise in this course.

Objectives

Although we have many common traits, no two teachers ever teach exactly alike. Your background, beliefs, and attitudes will influence the way in which you develop your teaching expertise. The ways in which you implement your teaching expertise will be influenced by the students in your classes and by school policy. Educators are thinking professionals who make thousands of major decisions about their instruction every day, and you must learn to make those decisions, often on your feet!

The structure of this course is based on my own beliefs about teaching. My perspective about learning is that you weave together your own knowledge from many strands, some of which are your understanding of your discipline, your background and personal experiences, your personal attitudes and beliefs about students and learning, and the teaching environment in which you operate. This perspective has influenced my attitude toward teaching. I do not believe that effective teaching is information transmittal in a lecture format. I do believe that effective teaching is learned by doing, not by sitting. Therefore, this course is designed to be highly interactive and to portray a "real" classroom to a much greater extent than you may have experienced before.

Your role is this course is the role of apprentice on the way to becoming journeyman and then master. Phil and I have the role of coach, cheerleader, and gadfly. You will have many opportunities to practice and to learn. We all will endeavor to assure that you learn from your practice. Together we will all work to sharpen our skills in the performance-oriented, fascinating art and science of teaching.

This course is designed to address the following questions:

1. How do students construct knowledge?

2. How do science teachers present concepts in the classroom?

3. How do science teachers manage laboratory learning?

4. How do science teachers decide what topics to teach and how to teach them?

5. How do science teachers teach problem solving strategies?

6. How do science teachers assess and utilize resources?

7. How do science teachers construct fair assessments of the many outcomes of learning?

8. How can science teachers effectively use audio-visual aids and computers?

9. How do science teachers provide a safe classroom environment?

10. How do science teachers accommodate diversity in their students?

Outcomes

The readings, activities, and assignments of this course are built around these questions. The purpose of this course is to help you work out your own answers to these questions. By the end of this course, you should be able to:

1. State your goals for secondary science teaching based on an informed position.

2. Use questions, demonstrations, and activities to probe students' concepts.

3. Describe teaching strategies which motivate students and which foster learning.

4. Describe teaching strategies to encourage meaningful problem solving.

5. Plan a science unit using a model of science teaching which takes student conceptual change into account.

6. Teach a lesson, lab, or demonstration employing appropriate strategies.

7. Choose appropriate assessment techniques to evaluate various learning outcomes.

8. Compare and evaluate secondary science curriculum materials, including audio-visual and computer materials.

9. Be able to store and/or dispose of chemicals properly and to select experiments based on appropriate safety guidelines.

10. Describe strategies to provide appropriate learning for a diverse student population.

Assignments and Grading

Major assignments are listed below. Detailed descriptions of each will be provided at a later date.

Assignment	**Number of Points**	**Due Date**
1. Journal	30	throughout
2. Unit plan	40	Thursday, 12/11/08
3. Lesson plan and microteaching	30	as assigned
4. Demonstration	20	as assigned
5. Laboratory activity	20	as assigned
6. Participation and attendance	10	throughout
7. Sample assessment	20	in unit plan
8. Concept map	10	in unit plan
9. V diagram	10	in unit plan
10. Technology component	10	in unit plan
11. EXAM I	50	Monday, 09/29/08
12. EXAM II	50	Monday, 11/10/08
13. Philosophy of teaching paper	50	Monday, 12/01/08
14. CHM 502 project	50	Monday, 12/01/08
15. Field experience letter	50	Monday, 12/01/08
Total points for EDCI 424	**400**	
Total points for CHM 502	**450**	

These assignments will be explained in more detail at appropriate times in the course. Following is a brief overview of each assignment.

1. *Journal*. Writing journal entries provides you with an opportunity to reflect on what you are learning and to assess your reactions to this learning. You will keep a journal of your reactions to

assigned readings and class activities. I will expect you to email a journal entry to me every other Monday, and I will comment on your reflections and answer any questions that you might have written.

2. *Unit plan**+ Planning is an essential skill in figuring out what to teach and how to teach it. You will use your knowledge of how students form concepts and a learning cycle model of teaching to develop a unit plan. You will submit the complete unit plan and teach three lessons from it to your classmates. *Each lesson plan should be detailed enough for any science educator to be able to look at the plan and be able to teach it.*

3. *Lesson Plan**+The ability to involve your students in learning and to information while simultaneously managing discipline is a critical part of the art of teaching. You will therefore present three lessons (demonstration, lab activity, and seatwork activity) from your unit plan.

4. *Demonstration**+ Demonstrations are a fundamental strategy in teaching science. You will choose a concept from your lesson plan, select the purpose of your demonstration, select an appropriate demonstration, and present it to your classmates.

5. *Laboratory activity**+ Laboratories are a hallmark of science education and a severe test of a teacher's organizational abilities. The skills needed to plan a laboratory, assemble the equipment, prepare the students, supervise the activity, and meaningfully discuss the data are only acquired after arduous practice. You will select a laboratory activity appropriate to your unit plan, lead a pre-lab discussion, supervise your classmates as they work through the activity, and lead a post-lab discussion in which you help your classmates relate the data to the scientific principles underlying the activity.

6. *Participation and attendance*. Social interaction and discussion often improve learning, and teaching requires social interactions by its very nature. If you must be absent for any reason, please arrange a time to discuss the material with me.

7. *Sample assessment** Test construction is a constant activity in a teacher's professional life. You will construct an appropriate unit test for your unit plan using a variety of assessment techniques.

8. *Concept map** Concept maps are a relatively new teaching strategy that can be very useful in a variety of roles. In this assignment you will construct a concept map of the topic of your lesson plan.

9. *V diagram** V diagrams are also a relatively new teaching strategy that can be useful with laboratory activities. You will construct a V diagram of the laboratory activity that you teach.

10. *Technology component**. Today's teachers are expected to be technology literate. You will learn to use the resources of the Web to construct a lesson plan.

11 & 12. *Exams I & II*. Tentatively, each exam will ask you to identify terms and to devise a plan of action to respond to a variety of scenarios, giving appropriate reasons for your decisions.

13. *Philosophy of teaching paper*. This paper provides an opportunity for you to reflect on what you have learned during the semester and on the kind of science learning environment you would like to create for your students. In this paper you will therefore describe in detail (1) your current philosophy of

teaching and (2) all of the components that go into creating an exemplary secondary science course, based on that philosophy. The paper should be 5-10, double-spaced, typed pages long.

14. *Major project**+* Each CHM 502 student will prepare an additional major project that will enhance the teaching repertoire of every student in the class. This project may be a special demonstration, laboratory activity, or lesson plan that will be made available to everyone in the class. If time permits, each CHM 502 student will teach the activity to the class.

15. *Field experience.* All students who are taking this course as part of their primary certification requirements must have some field experience in this course. This experience involves active teaching, not observation, every week of the course. The actual arrangements will be worked out with each student. Graduate students assigned to recitation sections may use those sessions to satisfy this requirement. Graduate students not assigned to recitations may be assigned as tutors in an appropriate resource room in order to meet this requirement. Undergraduate students may also choose to tutor in the Horizons program or in an appropriate resource room. Your supervisor will be required to confirm your participation.

**You are asked to make enough copies of this activity for everyone in the class. In this way everyone can begin to build a file of lesson plans, activities, etc. which will be an invaluable start in your professional career.*

+You will be videotaped when you are teaching the class. In addition to reviewing the written critiques of your teaching, you are asked to view the videotape and submit a written reflection upon the strengths and weaknesses of your teaching. This is done to encourage you to habitually reflect upon your own teaching.

Grades in the course will be computed on the basis of the total number of points accumulated divided by the total number of points possible (400 for EDCI 424; 450 for CHM 502). These scores are converted to whole number percentiles, and the following scale will be applied:

90-100	A
80-89	B
70-79	C
60-69	D
<60	F

Grades are NOT curved in this course. If everyone in this course garners points in the 90-100 range, then everyone will get an A.

Late work is NOT acceptable, just as it is not acceptable in the real world of classroom teaching. You are making the transition from student to professional educator in this course, and late or shoddy work will not be acceptable to me or to your classmates.

Schedule of Classes

Week # 1:	**DEMONSTRATIONS**	
08/25 M	Overview of course	Lab check-in Assessment of Understanding H/O on demos
08/28 Th	The art of demonstrations	Crouch, Fagen, Callan & Mazur Lesson plan format
Week #2		
09/1 M	**LABOR DAY NO CLASS**	
09/4 Th	Classroom: Common misconceptions	Nakhleh (a) Halloun & Hestenes Report on Assessment of Understanding
Week #3		
09/8 M	Demo #1_____	Demo #2_____
09/11 Th	Classroom: Planning a lesson	*Standards*, (handout) McComas
Week #4		
09/15 M	Microteaching: Demonstrations	
	Demo #3_____	Demo #4_____
09/18 Th	Laboratory: V diagrams	Gurley-Dilger
Week #5		
09/22 M	Microteaching: Demonstrations	**EXAM I**
	Demo #5_____	Demo #6_____
	Demo #7_____	
09/25 Th	Laboratory	Strain & Pearce Gerlovich, Whitsett, Lee & Parsa

Week #6 **LABORATORY ACTIVITIES**

09/29 M Microteaching: Labs

Lab #1_____ Lab #2_____

10/2 Th Laboratory Penick
Flinn activity

Week #7

10/6 M Microteaching: Labs

Lab #3_____ Lab #4_____

10/9 Th The Web & science teaching Web activity
Flick & Bell

Week #8

10/13 M **OCTOBER BREAK**

10/16 Th The Web & science teaching Web activity

Week #9

10/20 M Microteaching: Labs

Lab #5_____ Lab #6_____

10/23 Th Web lesson presentations & **MOLE DAY** celebration

Week #10

10/27 M Microteaching: Labs

Lab #7_____

10/30 Th Concept Maps White & Gunstone, Chapter 2

Week #11 **LESSON ACTIVITIES**

11/3 M Microteaching: Labs **EXAM II**

Lesson #1_____

11/6	Th	Groupwork techniques Using multiple resources	TBA Cañas et al. Cuda

Week #12

11/10	M	Microteaching: Lessons Lesson #2_____	
11/13	Th	Assessment Evaluation: Performance-based assessment	*Standards*, (handout) Hitt & Townsend Nelson Erekson Baumgartner

Week #13

11/17	M	Microteaching: Lessons Lesson #3_____ Lesson #4_____	
11/20	Th	Problem solving: Conceptual strategies	Watson Miles & Matkins Alexakos & Antoine

Week #14

11/24	M	Microteaching: Lessons Lesson #5_____	
11/27	Th	**THANKSGIVING BREAK**	**[START ASSEMBLING UNIT PLANS]**

Week #15

12/1	M	Microteaching: Lessons & discuss Exam II Lesson #6_____	**Phil. of Teaching Paper due** **Field Experience Letter due** **CHM 502 Project due**
12/4	Th	Social issues: Inclusive Classrooms	http://www.uni.edu/coe/inclusion/

Week #16

12/8	M	Microteaching: Lessons	
		Lesson #7_____	
12/11	Th	Speaker: practicing teacher	TBA **Unit Plan due**

Deadlines

12/1	**M**	**Philosophy of Teaching Paper & Field Experience Letter due to me**
12/1	**M**	**CHM 502 Project due to me**
12/11	**Th**	**Unit Plan due to me**
12/11	**Th**	**Post paper & unit plan on TaskStream plus narrative explaining how these documents meet the Indiana Standards**

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