BIOL_SCI 307/ TEACH_ED 351/ MS_ED 451
Learning and Teaching Human Biology

Credit: One (1) Northwestern University quarter unit (= 2 and 2/3 semester hrs.)

Date and Time: Tuesdays, September 28 – December 7, 2004, 5 p.m. - 8 p.m. for a total of 11 classes. All 11 classes are working sessions. There will be no final exam (more on this below).

Location: Northwestern University, Evanston Campus
School of Education and Social Policy (Annenberg Hall)
2120 Campus Drive
North Learning Studio (Room 303)

Co-Instructors:
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Expected Enrollment: 12

Prerequisites: 200-level Biol_Sci or instructor approval

Teaching Method: This course will be taught using project-based inquiry pedagogy (more on this below).

Reading: You will be provided with a week-by-week syllabus and packets of reading materials. (Reading materials have been tailored for each week of class, and will be distributed in class.) Recommended texts from which several readings will be derived include Lauralee Sherwood’s “Fundamentals of Physiology: A Human Perspective,” 2nd edition, Brooks Cole, ISBN: 0314042725 and Joseph Krajcik, Charlene Czerniak, and Carl Berger’s “Teaching Science in Elementary and Middle School Classrooms: A Project-based Approach,” 2nd edition, McGraw-Hill, ISBN: 0072486740. One copy of each book will be placed at the Main Library’s reserve desk.

Requirements: Participating high school science teachers will teach the 10-week-long Disease Detectives human biology curriculum during their participation in the course. Participating undergraduates (pre-service science teachers or science majors interested in education) will conduct their three performance-based assessments in partnership with the in-service teachers, observing the target lessons in these teachers’ classrooms. In this way, the course is designed to foster a unique learning community.
Evaluation: Participants will be evaluated on three performance-based assessments, modeled on the National Board for Professional Teaching Standards, including planning for teaching, teaching or observation, and teaching analysis and reflection. Participants will also be evaluated on weekly homework assignments, which are very abbreviated versions of the same performance-based assessment, as well as on their participation in class.

Performance-based assessments (due weeks 5, 7, and 11 only): Assessments weeks 5 and 7 are presented and discussed at the beginning of class but without the formal presentation required for assessment week 11 and are each worth 20% of your final grade. You will receive a rubric to assist you in completing these assessments and make clear the criteria upon which you will be evaluated. Assessment week 11 includes a more formal presentation and is worth 30% of your final grade. Due dates are FIRM!

Homework (due weeks 2, 3, 4, 5, 6, 7, 8, 9, and 10): You are only required to complete 7 of the 9 homeworks to receive full credit. All together, these homeworks are worth 20% of your final grade. They will be evaluated informally. You will receive a √-, √, √+, or + and written comments. Due dates are FIRM!

Participation: Participation (including discussing homeworks and assessments) is worth 10% of your final grade. Undergraduates are required to attend class week 11 (3/16/04) to present their final assessment. This is your final.

Assessment 1 = 20%
Assessment 2 = 20%
Assessment 3 + final presentation = 30%
7 of 9 Homeworks = 20%
Participation = 10%

(see table below for due dates; all due dates are FIRM!)
Welcome! This class is designed to take human biology content and science teaching methods (pedagogy) and combine them into a new kind of knowledge that is an amalgam of both. This new knowledge is called “pedagogical content knowledge” or “PCK.” Building our human biology PCK is the goal of this course (we’ll be talking a lot about this, so don’t worry if you’re not exactly sure what PCK is right now; read on). We’re working on building our human biology PCK based on recent science education research on the importance of PCK in learning to teach in an inquiry-based manner; this is cutting edge stuff! Very few models of courses designed to build PCK exist. We have had to design the class carefully to provide you with the right learning environment in which to learn to blend your understanding of content and pedagogy, i.e build your PCK. You will do this by learning to teach the human biology concepts addressed in an inquiry-based human biology curriculum [Disease Detectives: http://www.letus.org/mkits] Learning to guide students’ learning in this curriculum will serve as our project context, and to complete this project we’ll have to build our human biology PCK. Get it? Both this class and the Disease Detectives curriculum will address the same core concepts from human biology: levels of organization, homeostasis, energy processes, biochemistry of biological processes, and cell structure and function. We will explore how body systems influence health and the process of scientific inquiry. This content will be addressed in a conceptual rather than a taxonomic sequence. We will also study science pedagogy. We will learn to critically review the pedagogical approaches that will promote students’ meaningful understanding of these core science concepts and analyze and assess students’ understanding of these core science concepts. Many of the pedagogical approaches we will study (including project-based and inquiry-based science) have been designed into the Disease Detectives curriculum. See how this works? Dissecting the curriculum in detail is the best way for us to learn to integrate content and pedagogy in order to learn how best to teach human biology (= PCK). The Disease Detectives curriculum will thus serve as a backbone for the class, but the end-all for this course is obviously much more than just learning how to teach Disease Detectives. Also please keep in mind that since this course is somewhat experimental, we will require your active participation as well as your forbearance. Just look at how the co-instructors represent teaching, academic content, and the field of science education. That should give you an idea of how we’re trying to put back together knowledge that, when it comes to learning and teaching, should never have been split apart in the first place. This course will be a collaborative learning experience and we consider you to be our equal collaborators along with the instructors.

A Typical Class Meeting

Each class will meet for three hours each session and will follow a similar format with slight variations from week to week. First, you will discuss assignments (30 minutes), then participate in one of the Disease Detectives curriculum lessons as a learner. We will teach a Disease Detectives lesson to you in an inquiry-based manner and integrate technology into many of these lessons (70 minutes). After completing this lesson, we will “debrief”. We will learn more about the content and the pedagogy. We will review our teaching and learning the lesson as well as video clips of other classrooms learning the same lesson, and we will apply our content and pedagogy to support decisions about how best to plan and teach the lesson. In this way we will build our PCK (70 minutes). Finally, we will address practical issues (assignments and logistics; 10 minutes). For homework, we will read in more detail about the content and the pedagogy to
further improve our plans. We will share our support for these new decisions at the start of the next class. In this way we will make use of the readings as opposed to just talking about them. The teachers will teach the lesson in their own classroom and the undergraduates will watch an enactment of the lesson on video. (Undergraduates will view the enactment live in teacher’s classroom during Mastering PCK assessment weeks.) All will read ahead into the next week’s lesson and prepare to discuss what they think are the important features of that next lesson.

Learning Performances

The weeks where we’re “Mastering PCK” (see the table below) are a little different. We will use the same sorts of resources to design plans to teach the next lesson from Disease Detectives. Over the course of the week participants will teach and videotape the lesson, then review the videotape and analyze the outcome. Undergraduates will visit a classroom of one of the participant teachers, and use the same videotape to analyze the outcome. Participants will apply their knowledge of human biology to substantiate the pedagogical decision-making embodied by their planning, teaching, and analysis. In this way, the planning, teaching, and analysis is very practical work. “Mastering PCK” will happen three times and will comprise the performance-based assessments for this course. These performance-based assessments (in addition to the homework and participation) will be in lieu of exams. We expect that your work on these assignments will get more and more sophisticated as you make progress in the course! The course is designed around these concrete performances to support our constructing a useable understanding of the very complex task of teaching.
Homework (H) and Assessments (A) vary with that week’s “Developing PCK” and also with status as undergraduate or teacher.

**Week One**

**(H1)** During class we work together to build our template. For homework, all read assigned readings (longer this first week than any subsequent week; don’t worry!) and Disease Detectives lessons covered in class (Lessons 1 and 2.1). Teachers teach Disease Detectives lessons covered in class. Undergraduates watch extended enactment of same Disease Detectives lessons (on CD). All update template based on their readings + experiences and (next class) support new ideas added to template. All read next Disease Detectives lessons and draft new template for next lessons (Lessons 2.2, 2.3, and 3.1).

**Week Two**

**(H2)** During class we work together to build our template for Lessons 2.2, 2.3, and 3.1. For homework, all read assigned readings. Teachers teach Disease Detectives lesson covered in class. Undergraduates watch extended enactment of same lessons (on CD). All update template based on their readings + experiences and (next class) support new ideas added to template. All read ahead into next Disease Detectives lesson and draft new template for week 3’s Disease Detectives lessons (Lessons 3.2, 3.3, 3.4, 3.5 and 4).

**Week Three**

**(H3)** During class we work together to annotate our template for Lessons 3.2, 3.3, 3.4, 3.5 and 4. For homework, all read assigned readings. Teachers teach Disease Detectives lesson covered in class. Undergraduates watch extended enactment of same Disease Detectives lesson (on CD). All update template based on their readings + experiences and (next class) support new ideas added to template. All read ahead into next Disease Detectives lesson and draft new template for week 4’s lesson (Lesson 5.1, 5.2, and 5.3).

**Week Four**

**(H4)** During class we work together to annotate our template for Lesson 5.1, 5.2, and 5.3. For homework, all read assigned readings. All read ahead into Disease Detectives lesson and draft template for week 5’s lesson (Lesson 5.4, 5.5.)

**(A1)** Teachers teach Disease Detectives lesson covered in class, undergraduates observe teacher’s enactment of lesson (and videotape). All review videotape and notes. All update template based on their readings + experiences and (next class) support new ideas added to template. All turn in independent analysis and reflection (next class).

**Week Five**

**(H5)** During class we work together to annotate our template for Lesson 5.4 and 5.5. For homework, all read assigned readings. Teachers teach Disease Detectives lesson covered in class. Undergraduates watch extended enactment of same Disease Detectives lesson (on CD). All update template based on their readings + experiences and (next class) support new ideas added to template. All read ahead into week 6 Disease Detectives lesson and draft new template for week 6 lesson (Lesson 6).

**Week Six**

**(H6)** During class we work together to build our template for Lesson 6. For homework, all read assigned readings. All read ahead into week 7 Disease Detectives lesson and draft template for week 7’s lesson (Lesson 7.1 and 7.2).

**(A2)** Teachers teach Disease Detectives lesson covered in class, undergraduates observe teacher’s enactment of lesson (and videotape). All review videotape and notes. All update
template based on their readings + experiences and (next class) support new ideas added to template. All turn in independent analysis and reflection (due 11/9)

**Week Seven**

(H7) During class we work together to annotate our template for Lesson 7.1 and 7.2. For homework, all read assigned readings. Teachers teach Disease Detectives lesson covered in class. Undergraduates watch extended enactment of same Disease Detectives lesson (on CD). All update template based on their readings + experiences and (next class) support new ideas added to template. All read ahead into week 8 Disease Detectives lesson and draft new template for week 8 lesson (Lessons 7.3, 7.4 and Lesson 8).

**Week Eight**

(H8) During class we work together to build our template for Lessons 7.3, 7.4, and 8. For homework, all read assigned readings. All read ahead into week 9 Disease Detectives lesson and draft template for week 9’s lesson (Lesson 9).

(A3) Teachers teach Disease Detectives lesson covered in class, undergraduates observe teacher’s enactment of lesson (and videotape). All review videotape and notes. All update template based on their readings + experiences and (next class) support new ideas added to template. All turn in independent analysis and reflection (due 12/7).

**Week Nine**

(H9) During class we work together to annotate our template for Lesson 9. For homework, all read assigned readings. Teachers teach Disease Detectives lesson covered in class. Undergraduates watch extended enactment of same Disease Detectives lesson (on CD). All update template based on their readings + experiences and (next class) support new ideas added to template. All read ahead into week 10 Disease Detectives lesson and draft new template for week 10 lesson (Lessons 10 and 11).

**Week Ten**

During class we work together to annotate our template for Lessons 10 and 11. For homework, all work on 3rd and final Mastering PCK assignment. Teachers teach Disease Detectives lesson covered in class. Undergraduates watch extended enactment of same Disease Detectives lesson (on CD).

**Week Eleven**

We formally present the final “Mastering PCK” assignment, supplementing our presentations with video and other artifacts. We discuss at length. We review our experience with the course.

NOTE: Our content learning will build as we go! So don’t be surprised if the content we’re working on seems “easy” to you at the start. We planned it that way to better build your understanding. It will get harder as we go!
Expectations

You will be asked to complete several different tasks during this course. The amount of time doing out-of-class assignments (not including time spent teaching) should be approximately equivalent to the amount of time we spend together in class. You will:

1. Enact the Disease Detectives curriculum (teachers) or do classroom observations and review video of classroom enactments (undergraduates).
2. Read assigned articles on science content, pedagogy, etc.; and participate fully in class discussions, experiments, and activities.
3. Complete weekly homework and three main assignments (including videotaping).

However, this course will be graded like a graduate seminar in that quality of participation and effort and final product (especially the three main assignments) counts more than quantity. As such, there are no points awarded per task, although homework will be reviewed and the three main assignments will be graded with a rubric + written feedback.

Materials

You will be provided with several different types materials to support you throughout this course and also support the teachers’ enactment of the Disease Detectives curriculum. You will receive:

- A copy of the Disease Detectives curriculum
- Student/parent permission newsletters + student/parent permission forms for the classes in which you might videotape + CPS letter of support
- Out-of-class assistance from fellow classmates and instructors via listserv. (We might also have avenues for us to communicate with CPS and Evanston teachers who are enacting the curriculum for the second time!)
- Video clips to be accessed via CD-ROM
- Access to video equipment for in-class filming
- A week-by-week syllabus with the related packets of reading materials in human biology content, science teaching practice, and other relevant topics. (Reading materials have been tailored for each week of class, and will be distributed in class to be used on an as-needed basis.)
Our Course Philosophy

We believe that for both ourselves and our students, knowledge is actively constructed through learning experiences during which ideas are discussed, experiments are conducted, and materials are manipulated in order to make meaning. We expect to run this class in the same way. We believe that science is best conveyed using an inquiry approach where the learner is asked to use scientific methods and skills such as designing experiments, forming hypotheses, gathering data, arguing from evidence, and drawing conclusions to make sense of the science content. We believe that teaching is a complex process during which teachers must attend to many competing demands on their attention and time. We believe that teachers must focus on content, how students think, how to teach science content, how to manage students in small groups, what strategies to use to convey content, and how to teach science process skills. Each of these beliefs will be incorporated into the class structure. We also believe that technology can be integrated into science teaching to enhance learning and facilitate content understanding. We also believe that we, the instructors of this course, must strive to be your “guides on the side.” That being said, we will do everything possible to meet your expectations and needs during this course. Please be vocal with us about your needs as the course proceeds and we will make adjustments as best we can.

Whole group listserv for mass mailings and announcements

Email to: BIOQ_HIGH@listserv.it.northwestern.edu

Course website

We will also be looking into getting everyone access to a website for the course on Northwestern’s “Blackboard” system (https://courses.northwestern.edu/webapps/login). Please stay tuned about this.