EDCI 675: Learning and Teaching in Science

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Learning outcomes for EDCI 675:
This course is designed as the second in a sequence for prospective science educators in the Masters Certification Program. It comes in the fall semester of the year-long placement in schools, while some of you are observing and assisting in middle and secondary school classes and some are beginning to teach. By the end of the course, you will show:

• basic understanding of research on science teaching and how it may affect student learning, specifically with respect to conceptual knowledge, reasoning abilities and inquiry, epistemologies, and learning contexts;
• familiarity with instructional strategies of attending, assessing, and responding to student thinking;
• abilities to plan instruction, based on the materials, curriculum, and students in the classes you are teaching or observing;
• abilities to identify, interpret, and design appropriate responses to student thinking as evident in specific case studies of interviews, classroom observations, and first experiences teaching.

General description
The purpose of this course is to help you begin to develop practices of instruction — facilitating discussions, making presentations, providing explanations, assessing students’ learning and progress, and preparing lessons. With this course, we continue to focus attention on student learning, but we now make the transition to think about the relationships and interactions between student learning and instructional strategies.
Activities in the course include:
• reading and discussing research on learning and teaching in science;
• analyzing student thinking in ways we began in EDCI 411, as it is evident in observations and video of science classes, samples of students’ written work, or interviews;
• critically analyzing curriculum;
• observing experienced teachers’ practices and analyzing how they address (or may not) aspects of student knowledge and reasoning;
• reviewing and analyzing a range of assessment strategies and practices, from everyday classroom awareness to rubrics and exams;
• planning, implementing, and reflecting on the results of classroom instruction.

The course is designed to build on the foundation established in EDCI 411 of research on learning in science. At the beginning of the course we will review ideas from the
previous course, and then continue from there to focus on the craft of teaching: How do teachers understand and address what students need to learn? How do teachers assess and respond to student thinking?

In all, you will be required to
- read 30-50 pages per week;
- conduct a focus group with no more than 4 students, with 4-6 pages of written analyses;
- write a unit plan that they will teach;
- plan, implement, and reflect on two science lessons, with 4-6 pages of analyses;
- read, observe, and comment on other students’ work;
- attend and participate in seminar discussions.

Assignments (More detail will follow throughout the semester)

Focus Group:
This assignment is similar to the interview assignment from EDCI 411. You will pose a science question (e.g. “Where does all the weight come from, when an acorn grows into a tree?” or “If I leave a wet towel on a rack, and it dries, what happens to the water?” or you might consider posing the same question you did in the student interview from EDCI 411) to middle or high school students and interview no more than 4 students about their thinking. The purposes of the assignment are (1) to develop abilities for eliciting and listening to student reasoning, and (2) to gain insight into that reasoning, into what and how students know and think about natural phenomena.

Unit Plan:
As a follow-up of the curriculum analysis you wrote in EDCI 411, and if possible using a unit from that curriculum, you will write a unit plan. You will be asked to discuss the conceptual knowledge important for students’ understanding of the unit topic, and describe the instructional strategies that will be employed to teach it. You should focus on providing students opportunities to reason scientifically and participate in scientific practices and discourses.

Planning and implementing instruction (2):
This assignment asks you to plan lessons you will teach as part of your fall experience in schools. You will submit, discuss, and revise your plans, and then teach the lessons, finally preparing 4-6 pages of reflection on what took place. This work anticipates the case study assignments you will complete in the third course in the sequence in the spring semester.

Facilitate a discussion of a science topic:
In this class we will engage in “doing science” through discussing and investigating science topics. This assignment asks you, with a partner, to facilitate a “science talk”. You can choose any science topic, although you are encouraged to use topics relevant to the curriculum and subject you will be teaching; you will have ~45 minutes to facilitate
the discussion. You will also be asked to write an individual short 2-page reflection on the discussion to submit the following week.

Course meetings
Each meeting begins with the discussion of the assigned reading—generally one or two articles, which you are required to read carefully for detailed explication. The other activities during meetings include viewing and discussing video case studies of student thinking from classroom interactions; collaborative groups to present and discuss results from assignments; as well as discussions of topics within science.

Topics and readings

The semester progresses through five general topics of reading. Readings are selected in advance as follows, and then supplemented and adjusted during the course in response to participants’ particular interests and ideas. In lieu of a textbook, I will e-mail readings to you a week in advance of the date they will be discussed.

Review of models of student learning in science


Assessment

Assessment as inquiry

Issues in assessing student inquiry

Strategies, curriculum, and materials for teaching science as inquiry

Conceptualizing inquiry as an objective

General versus content-specific support
Promoting inquiry in project-based learning

Eliciting productive resources

Challenges and tensions of attending and responding to student thinking
Competing conceptualizations of science teaching

Coordinating multiple objectives—a view from mathematics

Attending and responding to student thinking — an example in science

Contexts and communities
Adapting curricula to meet student needs — an example in science

Tapping cultural funds of knowledge

Grading
Grades are determined based on the five written assignments and participation in seminar. Attendance is mandatory. The written assignments are weighed equally, and count for 90% of the grade; seminar participation for the remaining 10%.

*To earn an “A” in the course, you must complete all assignments in a timely fashion, following the guidelines given in class. Late assignments should be discussed with the instructor individually. You must demonstrate that you can attend to the substance of student thinking in the course assignments. Evidence of attention to student thinking is when you make a claim about student reasoning that is supported by evidence in the data, that is, in a video, transcript, or student written work. It is not sufficient*
evidence of attention to student thinking for the claim simply to identify whether the student is correct or incorrect; the claim and support must concern the sense of the student’s thinking from the student’s perspective. We will discuss this at greater length on the first day of class.

Attendance:
Attendance is mandatory. If you need to miss class, please notify either Anita or Jen prior to class via email.

Relevant student policies
Religious Observance: The University System of Maryland policy "Assignments and Attendance on Dates of Religious Observance" provides that students should not be penalized because of observances of their religious beliefs; students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances.

We are a diverse community and enroll students of many religions; pursuant to policy, we will do what we can when there are students’ requests for excused absences and make-up test requests due to reasons of religious observances. It is the student’s responsibility to inform the instructor of any intended absences for religious observances in advance. Notice should be provided as soon as possible but no later than the end of the schedule adjustment period.

Honor Code: The University is one of a small number of universities with a student-administered Code of Academic Integrity and an Honor Pledge. The Code prohibits students from cheating on exams, plagiarizing papers, submitting the same paper for credit in two courses without authorization, buying papers, submitting fraudulent documents, and forging signatures. Students should write the following signed statement on the top of each examination or assignment: I pledge on my honor that I have not given or received any unauthorized assistance on this examination (or assignment). Compliance with the code is administered by the Student Honor Council, which strives to promote a “community of trust” on the College Park campus.

Individual Needs Accommodation: The University is legally obligated to provide appropriate accommodations for students with documented disabilities. In order to ascertain what accommodations may need to be provided, students with disabilities should inform the instructors of their needs at the beginning of the semester. The instructor will then consult with Disability Support Services (314-7682). DSS will make arrangements with the student to determine and implement appropriate academic accommodations.

Your participation in the evaluation of courses through CourseEvalUM is a responsibility you hold as a student member of our academic community. Your feedback is confidential and important to the improvement of teaching and learning at the University as well as to the tenure and promotion process. CourseEvalUM will be open for you to complete your evaluations for fall semester courses between Tuesday,
December 1 and Sunday, December 13. You can go directly to the website (www.courseevalum.umd.edu) to complete your evaluations starting December 1. By completing all of your evaluations each semester, you will have the privilege of accessing the summary reports for thousands of courses online at Testudo.
Calendar
Fall 2009- tentative schedule of topics / due dates

August 31
Models of students’ conceptual knowledge in science

September 7: NO CLASS- Labor Day

September 14
Students’ scientific reasoning (Strike & Posner, 1992)

September 21
Assessment as Inquiry (Coffey, 2003)
Discussion of focus group assignment / Observation and analysis of student learning
Student interview / focus group due

September 28
Issues in assessing student inquiry (Duschl & Gitomer, 1997; Black & William, 1998)
Observation and analysis of student learning

October 5
Inquiry as an objective (Driver, et al., 2000)
Observation and analysis of student learning
Unit plan due

October 12
General vs. content-specific support for inquiry (Davis, 2003)
Facilitation of discussion- group 1

October 19
Promoting inquiry in project based learning (Polman, 2004)
Facilitation of discussion- group 2

October 26
Eliciting students’ productive resources for inquiry (Hammer & Elby, 2003)
First lesson planning due for discussion

November 2
Competing conceptualizations of science teaching (Sandoval & Daniszewski, 2004)
Facilitation of discussion- group 3

November 9
Coordinating multiple objectives (Ball, 1993)
Observation and analysis of student learning
First lesson plan and reflection assignment due

November 16
Attending and responding to student thinking (Hammer, 1997)
Second lesson plan due for discussion

November 23
Adapting curricula to meet student needs (Enyedy & Goldberg, 2004)
Facilitation of discussion - group 4

November 30
Tapping cultural funds of knowledge (Seiler, 2001)
Observation and analysis of student learning
Second planning and reflection assignment due.

December 7
Facilitation of discussion - group 5
Course evaluations