

Seminar in Math and Science Education (IE 197)

Spring 2004

Overview:

This course is a seminar whose goal is to investigate current challenges and practices in secondary education in the United States, focusing in particular upon math and science education. Students will consider how curricular choices, classroom strategies, the use of technology, race, ethnicity, gender, and assessment styles affect education in general. These considerations provide a foundation upon which to consider math and science education in particular. Harvey Mudd students will gain hands-on experience in this area by designing, leading, and evaluating a curricular unit of science and/or math at Pomona High School.

Rationale:

This course is intended for HMC students curious about and/or interested in a career in secondary science and math education. This course provides two unique and powerful opportunities. First, HMC students get to study the challenges facing educators in the context of working with a class of students at Pomona High School. Second, they have the opportunity to instill within these students – a bulk of which are underrepresented minorities – a passion for math and science, which in turn will hopefully influence these students' to pursue such topics at the college level (maybe even at HMC!).

The Integrative Experience and Science, Technology, and Society:

This class is foremost about process – the act of teaching science and math to high-school students. This process forces us (the scientific and mathematical elite) to step outside of our own specialized and cultivated technical understandings in order to provide a common ground upon which society at large can better understand our practices and disciplines. As you interact with Pomona High students throughout the semester, you are necessarily *embodying* this connection, facilitating a much-needed transfer of knowledge and competence. Throughout, you should critically reflect upon the experience you're having – What assumptions do you bring to the table and how do they impact your effectiveness as a teacher? Similarly, what assumptions do your students bring to the table? What (if any) aspects of mathematical and/or scientific topics make them (more) difficult to teach and/or less accessible to the population at large?

Student Responsibilities and Grading:

Students in IE197 will be graded primarily along three dimensions: your teaching at PHS, the seminar you present in class, and your class participation. Specific deadlines and requirements expected of the teaching and seminar components follow.

Class participation: Participation includes a variety of catch-all activities – contributing to class discussion, reading the assigned readings, and so forth. Each of these components will be weighted relatively equally. Two miscellaneous activities that also fall under participation include:

- Observing several classes at the Claremont colleges and some local high schools

(PHS and Diamond Bar).

- Keeping a stream-of-consciousness journal where you log your impressions of your class experiences. I will review these journals twice over the course of the semester. Please take these log entries seriously – they are a very effective tool for fostering critical thinking and reflection. IE seminars, PHS teaching, and classroom observation experiences should be included.

Teaching at Pomona High: You will collaborate with a group of three or four other IE197 students. Your group will propose, plan, and execute a seven-day unit of science and/or math education at PHS. You will be teaching to a group of between 8 and 15 high-schoolers, typically ranging in age from freshmen to juniors. You are all expected to attend each PHS visit. For every week of teaching, you are expected to meet once or twice outside of class with your group in order to plan and prepare that week's lesson. *I strongly recommend you set aside some fixed time each week in which you can all meet as a group for this purpose*

During each visit, a different member of the team will serve as the team's "recorder," observing the unit's execution so that the group can discuss these observations (and address any issues that arise) after the fact.

Deadlines:

- **2/9:** Each group should finalize a topic.
- **2/16:** Your group's 4 to 6-page lesson plan proposal is due. Although only one plan per group is required, it must be written collaboratively. Be sure to address:
 - Your high-level motivation for choosing this topic.
 - The over-arching set of goals and enduring understandings that your proposal is teaching towards.
 - A rough outline of each day's lesson plan. This outline should be detailed enough to ensure a coherent set of lessons at PHS. In particular, identify in detail the topic to be covered each day and propose at least one or two entry-level questions into it. Per day, a high-level group activity should also be proposed (also estimate what equipment you expect to need for this activity). Relevant mathematical and/or science topics that need to be taught should also be identified.
 - Identify some ways in which you intend to assess the lesson plan's effectiveness.
- **In the week of 5/3:** Again, collectively, your group will submit an 8-page paper that describes your group's lesson plan, its effectiveness, and reflects on what you have learned through this experience.

• **Your IE197 Seminar:** You will conduct a seminar on a controversial topic in secondary education of your choice. This task will involve constructing a reading list for the proposed topic, writing a two-page opinion essay to accompany these readings, and conducting an interactive hour-and-fifteen minute seminar in which all of your classmates and the instructor participate.

Deadlines:

- **10 days before your seminar:** Finalize your finalize a topic.
- **7 days before your seminar:** Finalize your reading list. You should include at least two substantial readings (i.e. more substantial than a news or opinion article) and at least two different points of view should be represented. Typically, reading lists have included anywhere from three to six reading in total (ranging from 25 to 50 pages total).
- **3 days before your seminar:** Turn a two-page opinion page on your seminar. This should include some leading questions for your readers to consider. At this time, we should also discuss in person what activity you plan to use in conjunction with your seminar presentation.
- **In the week of 5/3:** Turn in a full-fledged paper (8 pages) that extends upon your initial two-page seminar. This paper should provide a critical analysis that looks at the bigger picture of current challenges in math and science education practice. In particular, you should use this paper to explore the ways in which your seminar topic relates to one or more such challenges. You should make critical arguments that do not solely rely on information covered in your seminar's readings – you're also encouraged to draw on the wide range of your IE 197 experiences: video tape analysis, peer review, class discussion, assigned readings, anecdotal PHS teaching experiences, etc.