Contemporary Issues in Science Curriculum and Teaching:
Science Learning and Development
Fall 2005

Instructors
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Location & Time
Mondays, 12:40 – 2:30PM Erickson 224

Course Description
In the first hour of this course, members will participate in a science education seminar in which faculty, graduate students, and others from the science education community will share and discuss their current research. The second hour of this course will entail a more traditional graduate course structure in which we will talk about ideas related to science learning theory and development. In particular, we will discuss the following questions: How do students learn science? What do they learn, and when do they learn it? What implications do the answers to these questions have about teaching science? These are classic questions. In the last 30 years, there have been interesting developments to these questions with different research traditions, ranging from work on conceptual change, to sociocultural theory, to critical theory and others. In this seminar, we will read and discuss papers on learning theory that capture essential aspects of this development. As a culmination of the course, class participants will develop their own model of science learning that they will share with one another.

Course Objective
- To get acquainted with other science education faculty, post-docs, and students and to learn about their research.
- To investigate science learning theory and development. In particular, to investigate the following questions:
  - How do students learn science?
  - What do they learn, and when do they learn it?
  - How do different research traditions think about the answers to these questions?
  - What implications do the answers to these questions have about teaching science?
Assignments
In the first 45 minutes of class, a faculty member, post-doc, or senior graduate student will make a 20 minute presentation of some aspect of their research on a topic of their choice followed by a 20 - 25 minute discussion. The purpose of the talk and subsequent discussion is to allow us to get better acquainted with each others’ work and to provide the presenter some feedback on their work. As we have time for thirteen presentations during the semester, we are giving priority to faculty members, post-docs, and senior graduate students to present to the group. There will be a sign up sheet for the presentation times.

In the second hour of class, we will discuss the readings related to science learning theory and development. All students are expected to read the papers and be prepared to have a substantive discussion about them. Pairs of graduate students will take ownerships for providing a critical summary of the reading (copying and distributing the one-page summary), as well as organizing a discussion or activity around the main focus of the paper. There will be a sign up sheet for the article summary and activity.

Grades
Participation – 30%. Attendance is mandatory. If possible, please inform us ahead of time when you will be missing a session. Three absences may result in a non-passing grade.

Critical summary and class activity – 35%. The summary and class activity will be related to the reading for the week when you are the class leader.

Final paper – 35%. A five-page paper describing your model of science learning supported with an example. The paper should provide evidence that you have thoughtfully integrated ideas from the readings and discussions throughout the semester. Further details about the assignment will follow.

Course Schedule

8/29 Course Introduction
Introducing ourselves
Schedule of presentations

9/6 Labor Day Holiday - no class

9/12 Research Presenter:
Framing the Course – Learning Theory Perspectives


Skim:

9/19 Research Presenter:

Cognitive Perspective: Conceptual change


9/26 Research Presenter:

Cognitive Perspective: Responses to conceptual change


OR


10/3 Research Presenter:

Cognitive Perspective


10/10 Research Presenter:

Cognitive Perspective: Learning progressions


OR

meeting of the Ecological Society of America, August 9, 2005, as part of the symposium, Pathways to Scientific Teaching in Ecology Education, Montreal, Canada.

10/17 Research Presenter:

Sociocultural/situated perspective


10/24 Research Presenter:

Sociocultural/cognitive perspective


10/31 Research Presenter:

Sociocultural perspective


11/7 Research Presenter:

Sociocultural perspective


11/14 Research Presenter:

Critical Theory perspective

11/21 Research Presenter:

*Individuals choose and discuss selected papers according to each person's interest.*

11/28 Research Presenter:

*Discuss remaining selected papers and small group work on drafts of learning models.*

12/5 Turn in and share learning model papers

**Optional selected papers**


Reading and Critical Summaries

Developing understanding of a reading involves answering the following questions:
1. What is the author trying to say?
2. How does what the author is trying to say relate to writings of other authors? How is the author positioned in the field?
3. How would the author explain or interpret events related to science learning and teaching?
4. How does the author's understanding compare with yours?

Critical summaries will help begin our dialogue about the first two questions. A critical summary explains the main idea(s) of an article and expresses a particular point of view. The summaries should be no longer than one page.

A summary should clearly note that the information being conveyed is not your own. To be clear about who originally wrote the material, always begin your summary with the author's name and the title of the piece (i.e., book, article, web page, etc.).

A critical summary does not address any of the following questions:
- Do you like the article?
- Do you agree with the author?
- Is the premise realistic?
- Do the assertions reflect your personal experience?
- Is this kind of research useful for your doctoral dissertation?

A critical summary may address any of the following questions:
- Is the research method appropriate to the claims?
- What significant factors have been ignored in the analysis?
- What perspective does the article fail to account for?
- What counts as evidence? What doesn't count?
- What rhetorical strategies make the argument compelling, provocative, and/or weak?
- How does the article advance our understanding of what constitutes research? What are the epistemological and/or political implications of this research approach?
Guidelines for Paper

• **Demonstrate critical thinking and/or analysis.** The paper should make a clear point that is more than description or narration. The critical analysis should be your own original contribution, not simply a summary of other peoples' ideas.

• **Acknowledge multiple viewpoints.** Your paper should give evidence that you understand and appreciate more than one perspective on an issue. This does not mean you should be wishy-washy. Make a clear point by showing that you have considered alternate views.

• **Situate the argument in the field.** Your paper should make it clear to the reader which conversation in the literature you intend to join. The paper should draw from current literature, explain how others have addressed your issue, and state explicitly how your piece makes a contribution (e.g., synthesizes, emphasizes someone else’s findings, compares viewpoints, changes the question).

• **Draw from course materials.** Your paper should give evidence that you are taking this course. You do not need to agree with any of the readings or presentations, but your paper should show you have considered the course materials thoughtfully.

• **Support assertions with evidence.** Assertions or claims in your paper need to be supported. Evidence can come from the readings, discussions, and your personal experience, as long as the kind of evidence is pertinent to the claim.

• **Challenge assumptions.** The paper should show that you have learned something by doing this paper. There should be evidence that you have been open to changing your mind.

(Thanks to Lynn Fendler for critical summary and paper guidelines.)