

SCI 6160 – LEARNING & TEACHING MODELS
Fall 2006, Wednesdays 5:30-8:30
2734 Wood Hall

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Course Description

This course will complement SCI 6150 in addressing the remaining themes or “commonplaces” of education in a science education context, namely learning and teaching. The major models of learning and approaches to teaching that are compatible with those models will be examined, including their relevance to classroom practice.

Required Reading

Books

Blakemore, S.-J., & Frith, U. (2005). *The learning brain: lessons for education*. Malden, MA: Blackwell.
Donovan, M.S., & Bransford, J.D. (2005). *How students learn: science in the classroom*. Washington, DC: Committee on How People Learn: A Targeted Report for Teachers, National Research Council, The National Academies Press.
National Research Council. (2000). *How people learn*. Washington, DC: National Academy Press

Articles – Cognitive Science

Hunt, E. (1989) Cognitive science: definition, status, and questions. *Annual Review of Psychology* 40 (1), 603-629.
Jung, W. (1993). Uses of cognitive science to science education. *Science & Education*, 2 (1), 31-56.
Piaget, J. (1964) Development and learning. *Journal of Research in Science Teaching*, 2 (3), 176-186.
Reprinted in 2003, Vol 40 (S1), p. S8-S18.
Shavelson, R.J., Ruiz-Primo, M.A., & Wiley, E.W. (2005) Windows into the mind. *Higher Education*, 49 (4) 413-430.
Wittrock, M.C. (1979). The cognitive movement in instruction. *Educational Researcher*, 8 (2), 5-11.

Articles – Conceptual Change

Posner, G., Strike, K.A., Hewson, P., & Gertzog, W. (1982) Accomodation of a scientific conception: toward a theory of conceptual change. *Science Education*, 66, 211-227.
Nersessian, N.J. (1989). Conceptual change in science and in science education. *Synthese*, 80 (1), 163-183

Articles – Cultural Issues

Cobern, W.W., & Aikenhead, G.S. (1998). Cultural aspects of learning science. In B. Fraser & K.G. Tobin (editors), *International handbook of science education, part two*. Dordrecht, The Netherlands: Kluwer Academic Publishers, 39-52.
Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal*, 32 (3), 465-491.

Grading & Assignments

Please type all work in a 12 point font, using 1-inch margins and 1.5 line spacing. Number all pages. Use the word count feature in your word processing program to make sure your work is within required word/page limits.

Being Prepared (20% of grade)

Come to class each meeting having carefully read the assigned pages. Bring any notes you have taken on the readings and reflections from your own teaching and learning experiences. Turn in a summary (2-3 pages, double spaced, 12 point font, 1-inch margins) for each reading. The summary should include:

- An introductory paragraph that states the main point(s) of the article or chapter
- A summary of the main arguments the author(s) make(s) in the article
- A concluding paragraph that discusses your thoughts on the article – did you find it persuasive or not? Why? How does the article pertain to your teaching or learning?

It is acceptable to use quotes in the summary, however please keep these short (less than 2 lines) and use sparingly. I want to know what you understand about the article, not what the author(s) said. Cite the page number from which you took the quote.

Discussion Leadership (20% of grade)

Prepare discussion questions for the class as a handout (approximately 1 page of questions). Lead the discussion for 2 of the discussion periods.

Research Paper (35% of grade)

Choose any science concept that is of interest to you. Conduct a thorough literature review of what is known about the teaching and learning of this science concept. Write a 10-15 page paper covering the following:

- Review of the literature pertaining to the concept
- Summary of what is known about teaching and learning this concept
- Description of a research project designed to advance your understanding of teaching or learning related to this concept

The paper should be divided into several sections, each with a heading. At the minimum, these sections should include:

- An abstract that summarizes the main point(s) of the paper. The abstract should be a single paragraph and should not contain any citations. Single space the abstract and indent it 2 inches (total) from the left and right margins. The abstract should be between 200-300 words.
- An introduction that sets up the context of the paper. Why is the paper important? Why should children learn this topic? Set the paper into a broad but related context of teaching and learning.
- A literature review section that summarizes what is known about teaching and learning of this concept. This is where you cite other people's work on this topic. You might consider subdividing this section with several sub-headings to organize your work
- A research proposal section that describes a study you could do to further investigate teaching or learning of this topic. How will you conduct the study? Who will the participants be? What data will you collect and how will you collect it? How will you analyze the data and what will the analysis tell you? Again, consider subdividing this section by using sub-headings. If you are planning to use data collection tools (interview questions, pre-tests and post-tests, etc.) give examples of these in an appendix to your paper.
- A conclusion that summarizes the main points of the entire paper, including both the literature review and the research proposal.
- A list of references cited in the paper.

You will be citing other people's work in the paper. Be sure to cite anything from another source (see academic honesty, below). Please make your citations in the text using the (Author, date) format. Include page numbers when you use direct quotes. For quotes longer than 40 words (about 2 lines of text), single space and indent the passage. You may use whatever format you desire for the reference list, just be sure to include all pertinent information [e.g., author(s), date, title, journal or book title, volume no., pages, publisher and city (if a book)].

Compose the research paper in sections; each section will receive feedback from your instructor. Use the feedback to improve the final version of the paper.

- Section 1: Literature review and summary of what is known. Due 10/18
- Section 2: Research proposal. Due 11/8
- Full final paper: Due 12/6

Final Exam (25% of grade)

Take-home exam given on the last day of class. Due by 5 pm, 12/11.

Academic Honesty

You are responsible for making yourself aware of and understanding the policies and procedures in the Graduate Catalog that pertain to Academic Honesty (pp. 25-27). These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. If there is reason to believe you have been involved in academic dishonesty, you will be referred to the Office of Student Conduct. You will be given the opportunity to review the charge(s). If you believe you are not responsible, you will have the opportunity for a hearing. You should consult with your instructor if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.

Students often misunderstand plagiarism; therefore, please refresh your understanding before doing any writing for this course. I strongly recommend that students consult <http://www.indiana.edu/~wts/pamphlets/plagiarism.shtml>

Daily Schedule

5:30-5:40	Class business
5:40-6:15	Gather/write responses to discussion questions
6:15-7:20	1 st discussion period
7:20-7:30	Break
7:30-8:30	2 nd discussion period

Course Schedule (updated 10/3/06)

Week	Date	Leader	1 st Discussion Period	2 nd Discussion Period
1	9/6/06	HP	Introduction, syllabus, and expectations	
2	9/13/06	HP	Intro to Cognitive Science <i>Piaget (1964)</i>	<i>Wittrock (1979)</i>
3	9/20/06	HP	Intro to Cog Sci – cont'd <i>Hunt (1989)</i>	<i>Jung (1993)</i> <i>Shavellson et al. (2005)</i>
4	9/27/06	HP	The Science of Learning: Key Findings <i>HPL p. 3-27 and HSL p. 1-26</i>	Discuss group discussion leadership assignments
5	10/4/06	1. HP 2. CP	Experts and Novices <i>HPL p. 31-50</i> The Transfer of Learning <i>HPL p 51-78</i>	Conceptual Change <i>Posner et al. (1982)</i>
6	10/11/06	1. AJ 2. H3	<i>Nersessian (1989)</i>	Cultural Issues <i>Ladson-Billings (1995)</i>
7	10/18/06	1. HP 2. JP	<i>Cobern & Aikenhead (1998)</i>	How Children Learn <i>HPL p. 79-113</i> Lit review/summary due
8	10/25/06		No class (GSA)	
9	11/1/06	1. SO 2. AN	Mind & Brain <i>HPL p. 114-127</i>	<i>Blakemore & Frith p. 1-52</i>
10	11/8/06	1. DA 2. JP	<i>Blakemore & Frith p. 53-110</i>	Research proposal due
11	11/15/06	1. H3 2. CP	<i>Blakemore & Frith p. 111-195</i>	
12	11/22/06		No class (Thanksgiving Break)	
13	11/29/06	1. SO 2. AN	Scientific Inquiry <i>HSL p. 397-419</i>	Light <i>HSL p. 421-474</i>
14	12/6/06	1. DA 2. AJ 3. HP	Guided Inquiry <i>HSL p. 475-513</i> Developing Understanding <i>HSL p. 515-565</i>	Pulling Threads <i>HSL p. 569-590</i> Final paper due
15	12/11/06		Final Exam due, 5 pm	