TE 955 Contemporary Issues in Science Curriculum and Teaching

DEVELOPMENT OF LEARNING PROGRESSIONS FOR ELEMENTARY AND SECONDARY SCIENCE TEACHER EDUCATION

Monday, 12:40-2:30 PM, Room 228 Erickson Hall
Fall 2008

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Course Description/Objectives:
Over the past several years, there has been growing effort in the science education research community to understand how knowledge of important scientific concepts deepens and becomes more sophisticated over time. Taking the research on student learning as a starting point, much of this work has focused on the development of powerful assessments that can describe and evaluate this progression of understanding. In this seminar, we will focus our attention on articulating how research on learning progressions across diverse populations (e.g., elementary-, secondary- and more recently, college-aged students) might inform our work in teacher education—in particular, on the design of articulated programs and curricula for the preparation of elementary and secondary science teachers. These efforts will allow us the opportunity not only to become more knowledgeable about learning progression work more generally, but also to develop a learning progression-based framework that might guide the preparation of those planning to become teachers of science at the elementary or secondary level.

Course Requirements and Grading
Discussant and Synthesis Group Work (35% each, for total of 70% of final grade)
Everyone is expected to complete the assigned readings before seminar each week and be able to thoughtfully discuss these focus papers throughout the semester. Each person taking the course for credit also will (a) serve in the role of discussant for one faculty member or research group’s presentation and the reading assigned for that presentation and (b) be a part of a “synthesis group” for one of the two weeks in which this is the focus (i.e., 6 October or 3 November). The former will require that you meet with the individual(s) making the presentation, preparing an activity or a set of questions for discussion based on the presentation and reading, and leading the post-presentation part of the class. The latter will require that you meet with other members of the synthesis group to construct a PPT presentation summarizing what we know from the work in this area and what this work suggests in terms of some future research.
directions. You may also want to use the faculty members who have been working in this area as a sounding board for your ideas.

**Group Project (30% final grade)**
The group project for the course can focus on one of the following:

1) Select a scientific concept that holds a critical place in the achievement of scientific literacy. Create an argument, based on the literature, about its importance, and identify the component principles around which students at different age levels (select one age range, such as elementary, secondary, college-level) might develop principled ways of reasoning about this concept (i.e., construct a proposed learning progression).

2) Select a skill or idea that it is critical for a teacher of science to understand and be able to enact critically. Create an argument, based on the literature, about its importance, and construct a proposed learning progression for this skill or idea that extends across the pre- and in-service years.

Other ideas are encouraged, as long as you have a group that shares the same interest and this interest is related to the course focus. You should feel free to negotiate an alternative with me. NOTE that since this is a group project, each group member’s role should be adequately described.

**Note about Participation and Attendance:** The success of any seminar course hinges on active participation by each member. Each participant is expected to come to class ready to contribute thoughts and prepare for class each week through readings and course projects. In this way, each person will not only benefit from his/her own efforts and experiences, but also from those of the whole community. Because it’s not possible to participate if you do not attend and because we only meet as a group once a week, your final grade will be affected by anything beyond one excused absence. Please let us know in advance if you anticipate missing a class.

**Course Schedule: Course Readings & Assignments**

**August 25 First class**

- Introduction to course and to learning progressions; negotiation of class day/time; sign up for discussant slot and synthesis group presentation

**September 1 Labor Day. No class.**


**September 8: Perspectives on Student Growth, Identity, and Learning**
Presentation: Edna Tan

Readings:

Discussant: HsingChi von Bergmann

**September 15: Learning Progressions in K-12 Students (A)**

Presentation: Amelia Gotwals, Michelle Williams

Readings:

1) Songer, N.B. & Gotwals, A.W. Multi-scaffold assessments: Making a case for an assessment system that includes middle knowledge in science. Ms. in review.

2)

Discussants: Takumi Sato (Gotwals); Courtney Schenk (Williams)

**September 22: Learning Progressions in K-12 Students (B)**

Presentation: Environmental Literacy group


Discussants: Hayat Hokayem

**September 29: Learning Progressions in K-12 Students (C)**

Presentation: Christina Schwarz


Discussant: Adie Slaton & Ibrahim Delen
**October 6: Synthesis of work on K-12 student learning progressions**

Presentation: (graduate student group)

**October 13: Learning Progressions in College Students—General Population**

Presentation: Joyce Parker & Merle Heidemann


Discussant: Summer Lindzey

**October 20: Learning Progressions in College Students—Elementary Teacher Candidates**

Presentation: Ed Smith & Christina Schwarz

Reading:

Discussant: Li Zhan

**October 27: Learning Progressions in College Students—Secondary Teacher Candidates**

Presentation: Secondary Science Faculty (Gail, Joyce, Amelia, Andy; Mark O. also? (Knowles Foundation-funded work)

Reading: TBA

Discussant: Amy Lark

**November 3: Synthesis of work on undergraduate student learning progressions**

Presentation: Graduate student group
November 10: Articulating Scientific Literacy through Work on Learning Progressions

Presentation: Ted Willard & Jo Ellen Roseman, AAAS


Discussant: Hosun Kang, Amal Ibourk

November 17: Presentation of Group Projects: Session I (or Guest speaker)

November 24: Presentation of Group Projects: Session II

December 1: Presentation of Group Projects: Session III

December 8: Planning Future Work

Selected Relevant References


Catley, K., Lehrer, R., Reiser, B. Tracing a prospective learning progression for developing understanding of evolution. Paper Commissioned by the National Academies Committee on Test Design for K-12 Science Achievement, 2005.

Cavanaugh, S. Science interest could foster ‘learning progressions’. Education Week, 2006…


Draney, K., Mohan, L., Piety, P, and Choi, J. Learning progressions in the carbon cycle. Symposium on Learning Progressions, annual meeting of the AERA, Chicago, IL, 12 April, 2007. (Perhaps the one set of ppt slides from Lindsay’s presentation.)


Duncan, R. G., Rovat, A., Yarden, A. Learning progression in genetics. Unpublished manuscript


Stevens, S., Shin, N., Delgado, C., Krajcik, J., & Pellegrino, J. Developing a learning progression for the nature of matter as it relates to nanoscience.