

# Cognition & Development

Mathematics, Science & Technology Education Courses for Fall 2011

**EDUC 200C 001**

**CULTURAL PERSPECTIVES ON COGNITIVE DEVELOPMENT**

**CCN 23974 3 units**

**Monday, 2 -5 PM**

**4607 Tolman Hall**

**SAXE [saxe@berkeley.edu](mailto:saxe@berkeley.edu)**

*Approved to meet the EMST & SESAME Individual & Social Cognition Requirement*

This seminar explores Piaget's and Vygotsky's frameworks for the analysis of cognitive development and recent extensions of their work. Throughout a focus will be on culture and its representation in treatments of cognition. Readings will include excerpted sections from Piaget's books on infancy and childhood, Ginsburg & Opper's Piaget's Theory of Intellectual Development, Vygotsky's Mind in Society and Thought and Language. We'll also read some contemporary work that extends these frameworks.

**EDUC 205 001**

**INSTRUCTION AND DEVELOPMENT**

**CCN 23989 3 units**

**Monday, 1 -4 PM in 3507 Tolman**

**Kathleen E Metz; [kmetz@berkeley.edu](mailto:kmetz@berkeley.edu)**

An examination of cognitive developmental approaches to instruction. Review of different theoretical orientations to learning and memory, metacognition, emergent literacy, reading, writing, mathematics, science, computer literacy, motivation, self regulated learning, and classroom organization.

**EDUC 224A 001**

**MATHEMATICAL THINKING AND PROBLEM SOLVING**

**CCN 24061 3 units**

**Wednesday, 1 -4 PM in 4635 Tolman**

**Alan H. Schoenfeld; [alans@berkeley.edu](mailto:alans@berkeley.edu)**

*Approved to meet the EMST & SESAME Discipline-specific course requirement*

This course explores contemporary research on mathematical cognition, with a particular emphasis on "higher order thinking skills" and problem solving. It is intended to offer a combination of hands on experience and theoretical underpinnings. The hands on part will come, first, by means of ongoing problem solving activities in the course – a substantial part of our time will be devoted to solving problems and reflecting on our solutions to them. This work will provide the experiential backdrop for our excursions into the literature, where we dip into the research base on problem solving. Then, toward the middle of the course, we get empirical once again. Each student in the course will design and conduct a research project that takes a close look at people engaged in mathematical thinking and problem solving. The culmination of the course is a series of research reports in which the students in the course present what they have found and use those findings to reflect on the literature.

**EDUC 229F 001**  
**CONCEPTUAL CHANGE**  
**CCN 24063 3 units**

**Monday, 10AM – 1PM in 3507 Tolman Hall**

**Andrea A diSessa; [adisessa@soe.berkeley.edu](mailto:adisessa@soe.berkeley.edu)**

*Approved to meet the EMST & SESAME Individual and Social Cognition course requirement*

"Conceptual change" concerns broad and deep changes in a person's knowledge about a domain. This opposes it, for example, to the learning of facts and skill acquisition. The course emphasizes recent cognitive science-oriented approaches to: defining "broad and deep" learning; understanding its properties. It draws on diverse other approaches including developmental psychology; analogies to the history of science; "misconceptions;" computational and epistemological approaches.

**EDUC 231 001**  
**INSTRUCTION SECONDARY SCHOOLS: Teaching Methods**  
**CCN 24064 2 units**

**Monday, 2-4 PM in 4529 Tolman Hall**

**Dan Zimmerlin; [danz@berkeley.edu](mailto:danz@berkeley.edu)**

*Required for MACSME Program. Enrollment limited to students in the MACSME Credential Program*

Seminars, lectures, workshops to meet requirements for the single subject credential. Subject areas include educational psychology; instructional strategies; learning processes; and secondary school mathematics, science, and technology.

**EDUC 290C 001**  
**DESIGN-BASED RESEARCH FORUM**  
**CCN 24184 3 units**

**Monday, 1PM-4PM in 4607 Tolman Hall**

**Dor Abrahamson; [dor@berkeley.edu](mailto:dor@berkeley.edu)**

This course constitutes a design-based research forum for participant students to receive support in their on-going work and discuss pertinent literature. This literature as well as a framework/timeline for meeting project milestones will be the main differences between this course and a regular research group. The focus will be on each student individually developing a design, and the literature will feed directly into all students' growing understanding of issues to anticipate as they carry out their studies as well as theoretical models for interpreting data from these studies. Designs will most commonly include actual mixed-media artifacts, including materials, activities, and mediation emphases. Course participants can choose any content, age group, and media, but the types of design rationales I will encourage will include a cognitive component and are inspired by constructivist/ constructionist pedagogical philosophy. Participants are to bring their designs through to piloting. *This course is suitable for DMS, EMST, MACSME, and SESAME students.*

**EDUC 290C 004****SCIENTIFIC THINKING AND LEARNING****CCN 24193 3 units****Wednesday, 1-4 PM in 4529 Tolman****Eric Eslinger; [eric.eslinger@berkeley.edu](mailto:eric.eslinger@berkeley.edu)***Approved to meet the EMST & SESAME Discipline-specific course requirement*

This course will examine issues in the teaching and learning of science. We will survey contemporary research on scientific concepts, processes and beliefs, to explore what students think about natural phenomena and how students think scientifically. We will further consider how the results of these investigations can be used to improve science instruction.

This course is intended to satisfy the "action-oriented" domain-specific cognition requirement in the EMST, SESAME, and MACSME curricula. As an action-oriented course, this course includes a major research project. Students will plan, conduct, and report on a research project in which they examine science learning and teaching. This project should center on student cognition rather than teacher cognition or professional development.

**EDUC 290 005****How to get your Ph.D. and Get a Good Job****CCN 24196 3 units****Thursday, 1-4 PM in 2515 Tolman****Michael A Ranney; [ranney@berkeley.edu](mailto:ranney@berkeley.edu)**

This course is meant to provide graduate students with career-advancement skills (and folklore). It is highly appropriate for students who are in their third year and beyond, and most germane for students who will be applying for post-Ph.D. positions during '11-'12 or '12-'13. If space permits, more junior graduate students may be admitted, particularly if they are students who (1) may feel somewhat left out of the "good old person" network (either personally, or by virtue of membership in a group), or (2) want to get an early view of how they might wrap up their graduate school experience. Grad students from all areas of Education, Psychology, and fields of Cognitive Science are especially encouraged to take part in this course. (Grad students from any department are welcome, though.) Students are encouraged to take the course for S/U credit. Assignments will depend upon the student's status (e.g., year and program), but commonly include vita-generation, (elements of) application-generation, and performance in presentations (of readings, job-talks, etc.) and/or activities (e.g., mock interviews or practice lectures). Although a focus of the class is on acquiring job offers upon completion of one's doctoral thesis, the course has other foci: (a) helping people identify their roles, benefits, and implicit duties as graduate students, (b) learning how to reach professional milestones (e.g., via choosing dissertation topics and venues for publications and conference presentations), and (c) providing a support group and support services for students who feel a bit uncertain about their career trajectories. A diversity of faculty (i.e., of varying personal, academic, and professional backgrounds) will be invited to describe their experiences as students, applicants, employees, employers, evaluators, teachers, and mentors. The course's tentative schedule is meant to parallel the steps in acquiring an academic job (i.e., for those in their last year of graduate school), while most of the interstitial class time will be used to focus on the needs of graduate students in general—not just those who are planning to leave us so shortly. However, in reflecting the makeup of the class, focus will likely also be drawn to acquiring nonacademic (school-based, industrial, governmental, etc.) positions.

The course has generally yielded desirable results for its participants in the past, and it is only offered every 2-3 years, so you are encouraged to take it now if you have the opportunity and interest.

### **EDUC 290C 006**

#### **Teacher Research into Revolutionary Approaches to Math and Science Education**

**CCN 24199 3 units**

**Tuesday, 5:30 - 8:30P in 4529 Tolman**

**Barbara White; [bywhite@berkeley.edu](mailto:bywhite@berkeley.edu)**

One of the major challenges that students in the MACSME program face is learning about innovative approaches to math and science education and determining how to implement these approaches once they enter the field. This class will focus on connecting what we're learning about teaching methods in our coursework at UC Berkeley to the experiences of real world teachers. Ultimately, MACSME's will begin to develop a sense of their own personal teaching philosophy, as well as how they can incorporate this into their practice in the first few years of their teaching practice. This will include reflecting on how these methods can fit within the social and political context of today's schools. This course will be developed by and for MACSME's, and influenced by the needs and contributions of the participants.

### **EDUC 290C 007**

#### **MODELING-BASED METHODOLOGY FOR DESIGN, LEARNING & RESEARCH**

**CCN 24202 3 units**

**Wednesday, 1-4 PM in 4648 Tolman**

**Dor Abrahamson; [dor@berkeley.edu](mailto:dor@berkeley.edu)**

*Approved to meet the EMST & SESAME Group B Qualitative Methods Requirement*

The seminar focuses on technology-based modeling methods supporting a range of research practices within education and beyond. Specifically, we will explore: (a) design for student STEM content learning; (b) research on student STEM content learning; and (c) theory-of-learning research and development. Through these three research foci, a technology thread is agent-based modeling and simulation, a theoretical commitment is recognizing both individual and social aspects of cognitive development, and a disciplinary perspective is complexity studies. Students taking this seminar will develop basic mastery, and critical understanding, of agent-based modeling and become familiar with fundamental tenets of complexity theory and its epistemological, cognitive, and methodological challenges. Possible projects in this seminar, corresponding to the three course foci, are to: (a) build simulations of STEM content for student learning, e.g. chemistry, material sciences, physics; (b) build agent-based models that emulate observed behaviors of learners, whether individuals or cohorts, e.g., to model patterns in real data of classroom collaboration; (c) create simulations that foreground and problematize central tenets of education-research theoretical models, e.g., pitting Piagetian and Vygotskiiian perspectives; and also, (d) develop creative combinations thereof.

Note that no programming background is necessary in order to participate successfully in this course. In previous semesters here at UC Berkeley and, earlier, at Northwestern University, students who had never written a single line of code created wonderful projects. I will gladly send you samples of students' projects, which they presented at the GSE Research Day, to demonstrate how far one can go in a single semester! (E.g., one project demonstrated emergent phenomena in online poker, one demonstrated the cognitive-linguistic phenomenon that colloquial forms drift out of cohorts as contingent on their cohesion, another investigated the spread of heat in a rod, etc.) Granted, some students may have more experience than you, and that might make you feel slightly uncomfortable, but soon enough a class spirit should form in which students' prior experience is a resource of growth rather than discomfort. For sure, grading in this course is based on intellectual investment and contributions and not on the sophistication of the code per se. Furthermore, a dedicated SESAME graduate student will hold regular and, to the extent possible, customized office hours to support you in your early modeling steps. Moreover, be advised that the modeling environment we'll be using, NetLogo, is being

developed with the explicit objective of broad dissemination, such that to the extent possible the language emulates aspects of natural language-this feature has made NetLogo popular both with middle-school students, for science projects, and advanced social-science researchers, who publish their NetLogo-based results in top journals such as Nature and Science. So if you have any technology "inhibitions" or "phobia" that are making you hesitate taking this course, I'd appreciate if you gave me an opportunity to attempt to allay your fears. Please contact me!

Lastly, I wish to emphasize that the application of complexity methodologies to education is a nascent research effort. If, in general, you are interested in developing insight into, and theoretical models of, individual-social processes, I welcome you to expand your methodological palette with "the new tools in town." Furthermore, any quality paper written on this subject is by default "cutting edge." Thus, your insights and projects can greatly contribute toward deeper understandings, in the field of education research, of the analytic power and epistemological challenges of such "armchair turbo" thought experiments. To the extent that you come to value the promise of these methodologies, your skills should prove attractive to the growing nucleus of researchers beginning to appreciate the pertinence of complexity studies to understanding individual action in interpersonal milieus. Indeed, students who participated in this and related courses have submitted their course papers to conferences and have enjoyed acceptance, e.g., AERA 2008.

### **EDUC 293V 001**

#### **VIDEO-ANALYSIS SEMINAR**

**CCN 24231 1-3 units**

**Thursday, 9:30 AM-12:30 PM in 3515 Tolman**

**Randi Engle; [raengle@berkeley.edu](mailto:raengle@berkeley.edu)**

*Approved to meet the EMST & SESAME Qualitative Methods Group B course requirement (to meet the requirement the course must be taken for three units)*

This ongoing seminar is for anyone devoting a significant portion of a given semester to analyzing videotaped records as part of their research. Video-based data are now ubiquitous in educational research and this group is designed to help us all become more savvy at analyzing them. Strands of the seminar, each worth 1 unit of credit, are devoted to participating in video-analysis sessions, reading about video-analysis methods, and completing a paper on your own video-analysis project.

### **EDUC 390D 001**

#### **Supervised Teaching in Math and Science**

**CCN 24427 2 units**

**Monday, 1 -2 PM in 4529 Tolman Hall**

**Dan Zimmerlin; [danz@berkeley.edu](mailto:danz@berkeley.edu)**

Fieldwork for teaching credential. Supervised teaching may begin with the opening of the public schools in the fall and extend through the spring semester. Enrollment limited to students in the MACSME Credential Program

## SCIENCE AND MATHEMATICS EDUCATION (SESAME)

### FIRST YEAR SEMINAR

**SCMATHE 210 001 | CCN 79303 | 2 units | Tuesday, 11AM – 1PM in 3507 Tolman Hall**

**SCMATHE 210 002 | CCN 79306 | 2 units | Thursday, 11AM – 1PM in 3507 Tolman Hall**

**Eric Eslinger; [eric.eslinger@berkeley.edu](mailto:eric.eslinger@berkeley.edu)**

*EMST, SESAME & MACSME students entering F11 should enroll in both Sec. 1 and Sec. 2 of SCMATHE 210*

Goals for students:

1. To develop an understanding of and familiarity with a broad cross-section of the cognitive, developmental and learning sciences literature that informs and guides the research agendas of Graduate School of Education (GSE) faculty working in the fields of instruction and learning in mathematics, the basic sciences and in engineering-related studies.
2. To develop an appreciation for the major issues pertaining to research, design, and implementation in computer-mediated instruction, learning and assessment. In particular, this includes an appreciation of and sensitivity to issues of how to balance the sometimes competing demands of research and instruction.
3. To form a learning community where they can learn from each other and will become integrated into the larger community of GSE graduate students and faculty.
4. To develop the skills and resources to begin to conceptualize potential research topics.

### SCMATHE 292 RESEARCH SEMINAR & COLLOQUIUM

**CCN 79309 1 unit**

**Monday, 4-6PM in 2515 Tolman Hall**

**Eric Eslinger; [eric.eslinger@berkeley.edu](mailto:eric.eslinger@berkeley.edu)**

*Required for all first and second year EMST, SESAME & MACSME students*