Cognition & Development Area: Education in Mathematics Science and Technology (EMST) Ph.D. Course Requirements for Students Admitted Fall 2006 and Later.

Approved by EMST Curriculum Committee May, 2006 and July, 2007 | Revised 10.29.10

The EMST program requires doctoral students to complete coursework in each of the following six categories. These courses provide exposure to the major concerns and issues of this field of study. Students, in consultation with their advisor(s), choose from the list of approved courses under each category. Students who wish to substitute other courses to meet the requirements may petition the EMST Curriculum Committee. There is additional coursework required by the Graduate School of Education, which is explained in the ***Handbook for Advanced Degree Students***

NB: Students must take required courses for a letter grade. A student's transcript is required to have a balance of courses with letter grades and pass/fail grades (or satisfactory/unsatisfactory) such that two-thirds of the course units have earned a letter grade.

First Year Seminar | two semesters during first year of enrollment:
SCMATHE 210 Practicum in Science and Mathematics Education, Research and Development

Colloquia | four semesters, taken in first two years of enrollment:
SCMATHE 292 Research Seminar and Colloquium

Individual & Social Cognition | two courses: Courses involving a cognitive science approach to thinking, learning or instruction.
EDUC 226 Constructive Epistemology
EDUC 227 Metacognition
EDUC 229A Proseminar: Problem Solving and Understanding (Also listed as Psychology C223)
EDUC 229D Discourse and Learning in Mathematics and Science Classrooms
EDUC 229F Conceptual Change
EDUC 232 Problem Solving and Understanding in Elementary School Classrooms
EDUC 290C Representations
EDUC 290C Principles for Embodied Design
EDUC 290C Neo-Vygotskian Perspectives on Cognitive Development
EDUC 290C Cognitive Ergonomics in STEM Education Research

Discipline | one course: Project-based courses on learning and instruction in a particular subject area (mathematics, computer science, or one of the physical sciences). In addition to extensive readings, the student must conduct, report on, and write up an empirical study (an experiment, clinical interviews, models of out-loud protocols, field work, etc.) germane to the course.
EDUC 222A Programming & Problem Solving
EDUC 224A Mathematical Thinking and Problem Solving
EDUC 290C Scientific Thinking and Learning
EDUC 290C Learning Chance: Computer-Supported Inquiry into Probability
EDUC 290C Paradigmatic Didactic Mathematics Problem Situation

Curriculum and Technology Design | one course: Project-based courses on the principled development of instructional materials. A major part of such courses is the production and/or evaluation a substantial piece of instruction.
SCMATHE 220C Instructional Design in Science/Mathematics Education
EDUC 221A Ambitious Instruction in Mathematics
EDUC 221B Curriculum Development & Instruction in Science
EDUC 290C Scientific Cognition: Development, Learning & Instruction
EDUC 295B Technology, Curriculum and Instruction

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Methodology | three courses: one chosen from *Qualitative Methodology Group A,* a second course chosen from *Quantitative Methodology* and a third methodology course chosen in consultation with your faculty advisor. Students may petition for a waiver or substitution of a course to meet the degree program requirements.

Qualitative Methodology Group A

EDUC 228A Qualitative Methodology
EDUC 228B Modeling of Knowledge and Cognitive Processes
~~EDUC 288B Theory and Methods of Field Work~~ (no longer taught as of Fall 2008)

Qualitative Methodology Group B

EDUC 293V Video-Analysis Seminar
EDUC 290C Modeling-Based Methodology for Design, Learning, and Research

Quantitative Methodology

EDUC 293A/L **Data Analysis in Education Research/Lab**[1]
EDUC 275B/L Data Analysis in Educational Research II
Psych 205A Psychological Statistics and Data Analysis

NB: The Graduate School of Education requires doctoral students to take one Qualitative Methods course and one Quantitative Methods course. Courses in **bold text** are approved by the GSE to meet their methodology course requirements. Please see the Graduate Assistant in Student Academic Services Offices (1603 Tolman Hall) regarding polices and regulations governing the approval of substitutions for courses required by the GSE.

[1] ***Section*** *1 takes a conceptual and heuristic approach and includes a module on distribution free statistics.* ***Section 2*** *takes an algebraic approach and includes a module on multiple regression.*