

Curriculum Development in Mathematics Education
EDCI 645 (3 credits)
Fall 2009

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Class Meets: Wednesday, 4:30 – 7:10

I. Course Description

Seminar for Master's level students in the Mathematics Education Leadership program. Engages students in analysis, design and evaluation of school mathematics curricula. Prerequisite: Admission to the Mathematics Education Leadership Master's Degree Program

II. Student Outcomes

This course is designed to enable students to:

- A. Identify standards-based school mathematics curriculum projects K-12; Analyze key characteristics of outstanding curriculum materials for school mathematics.
- B. Examine learning theories that have been influential in mathematics education and identify ways those theories have been translated into curriculum materials and strategies for teaching.
- C. Evaluate research on NSF-funded and commercially developed school mathematics curriculum materials to make informed choices.
- D. Present and discuss a set of school mathematics curriculum materials in depth.
- E. Design a small curriculum project based on key design principals.

III. Relationship to Program Goals and Professional Organization

EDCI 645 is designed to enable mathematics education leaders to evaluate mathematics curriculum materials appropriate for school mathematics. The course was developed according to the joint position statement of the Association of Mathematics Teacher Educators (AMTE) and the National Council of Teachers of Mathematics (NCTM) on Principles to Guide the Design and Implementation of Programs in Mathematics Education.

This position statement indicates that the core knowledge expectations in mathematics education include:

- Design effective curricula and learning environments to facilitate the development of deep and connected mathematical understanding,
- Lead curriculum design, analysis and evaluation,

- Study different strands of curricula,
- Compare international curricula, and
- Demonstrate knowledge of historical, social, political, and economic factors impacting mathematics education and curricula.

IV. Course Readings and Materials

Meyer, M. & Langrall, C. (2008). *A decade of middle school mathematics curriculum implementation*. Charlotte, NC: Information Age Publishing.

National Council for Teachers of Mathematics. (2006). *Curriculum focal points for prekindergarten through grade 8 mathematics*. Reston, VA: NCTM.
<http://www.nctm.org/standards/focalpoints.aspx?id=282>

Virginia Standards of Learning

Other readings available via Blackboard.

VI. Course Requirements, Assignments, & Evaluation Criteria

The assignments across are intended to develop skills in mathematics curriculum analysis and evaluation. Students conduct in-depth study of mathematics curriculum materials, investigate NSF-funded mathematics curriculum projects, examine research on mathematics curriculum projects, and present an evaluation of their findings. Discussions will be focused on the nature and development of curriculum in schools. All assignments are to be completed on time so that class members might benefit from the expertise and contributions of their colleagues.

Successful completion of this course requires the following:

1. A commitment to participation in class discussions and activities.

The quality of this course depends heavily and primarily on the regular attendance and participation of all involved. Participation will include taking part in discussions informed by critical reading and thinking, leading discussions about selected mathematics problems, and sharing with the class the products of various writing, reflection, lesson planning, and field experience assignments. The expectations, demands and workload of this course are professional and high.

2. A commitment to reading reflectively and critically the assigned readings.

The readings will be used to provide a framework and coherent theme to the course content. They have been selected to introduce themes in curricular development as well as research and critical commentary on mathematics curriculum.

3. Mathematics Article Discussion (10%)

Part of your role as a mathematics specialist is staying in touch recent information about mathematics education that can be shared in your role. Find an article describing some aspect of students' knowledge of mathematics or addressing how to teach a particular mathematics topic. Post the article and your review on the Blackboard discussion site for the course. Then, lead a discussion in class regarding your article.

4. NSF–Funded Curriculum Review (20%)

Select one mathematics education curriculum project funded by the National Science Foundation (NSF). Conduct an in-depth analysis of the curriculum materials. Research and evaluate the NSF-funded project on a variety of attributes (which may include scope and sequence, relationship to NCTM Standards, content, research that has been published on the curriculum, etc.). Identify key characteristics of outstanding curriculum materials in the set of materials. Complete a written analysis identifying areas of weakness in the materials and suggested improvements for the designer (approx. 5-10 pages in length).

5. Curriculum Comparison (20%)

Compare two distinct types of textbook materials: a traditional mathematics textbook and a reform-oriented mathematics series (e.g., *Connected Mathematics*, *Everyday Mathematics*). Address how the materials have different approaches to mathematics, teaching and learning. Design an activity you would use to engage teachers in learning about how to use either of the sets of materials.

6. Curriculum Analysis Project (30%)

For this assignment, you will do a small study about curriculum design and implementation. In phase I, you will collect materials related to the curriculum for a specific grade band of teachers. In phase II, you will interview two teachers for their perceptions of curriculum. In phase III, you will combine your analyses from the first two parts of the assignments to describe how the ideal and implemented curriculum function in the school.

7. Mathematics Content Review (20%)

Investigate what is known about students' learning in a particular content area and prepare handouts for teachers that describe strategies for instruction based on the research.

Evaluation Criteria

Graduate Grading Scale

A 93%-100% B+ 87%-89% C 70%-79%

A- 90%-92% B 80%-86% F Below 70%

VII. UNIVERSITY POLICIES

The university has a policy that requests students to turn off pagers and cell phones

before class begins.

HONOR CODE

To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of George Mason University and with the desire for greater academic and personal achievement, George Mason University has set forth a code of honor that includes policies on cheating and attempted cheating, plagiarism, lying and stealing. Detailed information on these policies is available in the GMU Student Handbook, the University Catalog, of the GMU website (www.gmu.edu).

INDIVIDUALS WITH DISABILITIES POLICY

The university is committed to complying with the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 by providing reasonable accommodations for applicants for admission, students, applicants for employment, employees, and visitors who are disabled. Applicants for admission and students requiring specific accommodations for a disability should contact the Disability Resource Center at 993-2474, or the University Equity Office at 993-8730.

ATTENDANCE POLICY

Students are expected to attend the class periods of the courses for which they register. Although absence alone is not a reason for lowering a grade, students are not relieved of the obligation to fulfill course assignments, including those that can only be fulfilled in class. Students who fail to participate (because of absences) in a course in which participation is a factor in evaluation, or students who miss an exam without an excuse, may be penalized according to the weighted value of the missed work as stated in the course syllabus (GMU University Catalog, pg. 32).

Reading List

Date		Readings	Assignment Due
9/2	History of Curriculum		
9/9	Introduction to Standards (state, NCTM)	Curriculum Focal Points	
9/16	Levels of Curriculum Implementation	Clements	
9/23	Curriculum Fidelity – what does it mean?	Brown et al.	Mathematics Content Review
9/30	Curriculum Research – how to interpret/analyze	Schoenfeld, Post et al.	
10/7	Reform-based Curriculum	Decade, Ch. 1 -3	Curriculum Comparison
10/14	Adoption Processes	Decade, Ch. 5-10	
10/21	Teachers and Curriculum	Decade, Ch. 19-24	
10/28	Teachers and Curriculum (cont.)	Decade, Ch. 26-28	
11/4	Social Justice and Curriculum	Gutstein, Decade Ch. 13	
11/11	Teacher Development for Curriculum	Decade, Ch 14,	NSF Curriculum Review Project
11/18	International Perspectives	Schmidt et al.	
11/25	The Algebra Question	TBA	
12/2	NO CLASS		
12/9	Technology & Curriculum	TBA	Curriculum Analysis Project
12/16	Last Class - Summary		

Readings

Brown, S. A., Pitvorec, K., Ditto, C., & Randall Kelso, C. (2009). Reconceiving fidelity of implementation: An investigation of elementary whole-number lessons. *Journal for Research in Mathematics Education*, 40(4), 363-395.

Clements, D. H. (2007). Curriculum research: Toward a framework for “research-based curricula”. *Journal for Research in Mathematics Education*, 38(1), 35-70.

Gutstein, E. (2003). Teaching and learning mathematics for social justice in an urban, Latino school. *Journal for Research in Mathematics Education*, 34(1), 37-73.

Post, T. R., Harwell, M. R., Davis, J. E., Maeda, Y., et al. (2008). Standards-based mathematics curricula and middle-grades students' performance on standardized achievement tests. *Journal for Research in Mathematics Education*, 39(2), 184-212.

Schoenfeld, A. H. (2002). Making mathematics work for all children: Issues of standards, testing and equity. *Educational Researcher*, 31(1), 13-25.

Schmidt, W. A., Houang, R., & Cogan, L. (2002). A coherent curriculum: The case of mathematics. *American Educator*,