EDUCATION 783-001
MATHEMATICS CURRICULUM: RESEARCH AND DEVELOPMENT
FALL 2007

Professor
Vilma Mesa
vmesa@umich.edu
1360F SEB/647-0628

Class Meetings
Tuesdays 9:00-12:00 pm

Room
2225 SEB

Class website
http://www.ctools.umich.edu/

Description

What are researchable questions in investigating curriculum in mathematics? What are the methods that will yield interesting results in investigating mathematics curriculum? What are basic principles for developing curriculum in mathematics? These and other related questions will be addressed in this course.

The main purpose of this course is to help students develop an understanding of the school mathematics curriculum, with a particular emphasis on the U. S. and grades K-16. In this course, the curriculum is understood as both the explicit planned course of learning put before students, and the hidden or latent experiences that students encounter in school settings. Students will become familiar with many key issues faced by diverse stakeholders concerned with the school mathematics curriculum, including curriculum designers, researchers, evaluation specialists, assessment developers, and teachers.

To provide useful contrasts that should deepen students’ understanding of contemporary mathematics curriculum issues in the U. S., the course incorporates historical and international perspectives and current philosophical underpinnings of general curriculum theory. In this course we will get acquainted with issues of the intended curriculum (e.g., the nature of curriculum guidelines or textbooks), the implemented curriculum (e.g., teachers’ enactments of curriculum goals), and the attained curriculum (e.g., assessment of the effectiveness of curriculum).

Because this course is intended to help develop emergent scholars in the field of mathematics education, there will be in-depth investigations of the relationship between curriculum and research.

COURSE EXPECTATIONS

This 3-credit course is organized as a seminar format, in which the essential feature will be the in-class discussion of the weekly readings by all the attendees. Supportive, productive, and critical inquiry into curriculum issues is both an aim and a means for the course. Students are expected to attend all class sessions, to complete course readings prior to the class for which they are assigned, and participate actively in the discussions. Students are expected to inform the instructor, in advance, of absences.
Reading is a critical component of the course, and as an advanced graduate level course, the reading load is substantial. It is expected that students will come to class having read the assigned material thoroughly and thoughtfully and that they be willing to share their understandings of the readings in order to contribute to the learning of all class members. For each class session there will be a reading assignment. Students are expected to post a reflection on the readings, as indicated in the schedule, by the previous Monday, at noon. These contributions will be tracked in the Discussion section of CTools. Limit your contributions to 1,000 words.

Special Forms of Participation

Book review: Each student will select a piece from the list provided and write a review that will address the following seven questions, that are useful as a framework for beginning an inquiry into curriculum:

1. What is worth knowing and what is worth experiencing?
2. What conception of good life is implied by the curriculum?
3. Whose interests does the curriculum serve and for what kind of future is the curriculum explicitly or implicitly preparing students?
4. What stand does the curriculum take on questions of democracy and diversity?
5. What is the relationship between the knowledge embedded in the curriculum and those enacting the curriculum?
6. What kinds of relationships among school participants are best for enacting the curriculum?
7. How do the broader social conditions influence the shape of the curriculum and students’ experiences of the curriculum? (Beyer and Liston, 1996)1

The review must include also a final recommendation about the value of reading the book. The reviews will be presented to the class in one of the three following sessions: October 30, and November 6, and November 13. The presentation should be given in the form of a “Radio Book Review,” (à la NPR) which usually consist of a text that is read in no more than 4 minutes (for an example of such reviews see the examples provided in the Resources folder in CTools). Students are advised to talk to the instructor about their book choice and about their review piece at least two weeks before the due date. Post your review in CTools, prior to the class when you will give your review, in the corresponding folder under Resources.

The New Math, The Standards: A Debate. Each student will participate in a special class session on October 23. In preparation for this session, the class will be split into two groups. One group will be the experts on the “New Math” reforms; the second group will be the experts on the “Standards”

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movement. Each group will prepare a non-talking-head presentation (i.e., a parody, a dramatization, a personification, a song, a poem, a video) about the principles and rationale behind each of these approaches to reforming the school mathematics curriculum. In the first part of the class, each group will have 15 minutes for such presentation. In the second part of the class, we will conduct a debate. The instructor and students will play different stakeholder roles in the debate, asking questions of each group and demanding action for issues that are aligned with their own stakeholder roles. A portion of class on October 2 will be devoted to helping groups organize this presentation.

**Group Research Project.** Students working in pairs are expected to select a topic tied to the school mathematics curriculum issues treated in this course, to conduct an independent investigation of this topic, and to prepare a paper and a poster presentation based on this investigation. In many cases, the written paper will take the form of a review and synthesis of literature related to the topic, but other formats are also possible, depending on the nature of the topic being pursued. Students should select a topic in consultation with the course instructor, who can provide initial guidance in finding appropriate sources for the investigation.

The following listing of possible focus areas and topics is meant to be suggestive rather than exhaustive. Typical foci for this project might include:

- an analysis of a curriculum topic, either from a historical or a cross-national perspective (e.g., multiplicative reasoning, ratio, variables, proof, problem solving, functions, statistical reasoning, discrete mathematics); or

- an analysis of an innovative curriculum development project for undergraduate students within or outside the United States (e.g., Harvard Calculus Reform Project, College Algebra Reform, a national teacher education curriculum); or

- an analysis of one curriculum-related issue touched on in the course but not considered fully (e.g., the evolution and curricular implications of “mathematics for all” or “mathematics and democracy;” research and theory related to teacher learning through engagement with innovative student curriculum materials; the evolving role/place of technology in the school mathematics curriculum).

There are two products of this group research project, a poster presentation and a written paper (max 20 pages in length). The poster session will be held on December 4 and it will be conducted as a conference poster session. The written paper is due the last day of class, December 11.

The investigation will be a 4-stage process as follows:

1. **Selection of project focus.** Of the three alternatives proposed, students need to discuss and agree on one they would like to investigate together. Once they have agreed upon the focus of the investigation, students should write a memo presenting their topic, motivation, and learning goals for the project. This memo is due on September 20 by 5pm on CTools.

2. **Data collection and analysis.** Students should discuss with the instructor the types of sources they will use for their investigation. After such discussion, they will write a second memo including the timeline for working on the project, an outline of the paper, and assigned responsibilities for
collecting data, reporting, editing, etc., for both the paper and the poster. The memo should be posted on **October 4 by 5pm on CTools.**

3. **Paper draft:** Two weeks before the presentation of the poster (**November 20**), students should post a draft of their written paper (including references in APA style but not appendices) that will summarize the investigation. This draft will receive feedback from the instructor. Post the draft on CTools.

4. **Reporting:** Students will present both orally and in writing the results of their investigation. For the oral presentation (**December 4**) the students will use a poster, in which they will convey the main questions answered with the investigation, and insights and either potential avenues for research or practical applications of the investigation. Other graduate students or faculty in the SoE may attend the poster session. The written report is due on **December 11 by 9am** and it will contain both a description of the project and a critique of the findings. More details about these activities will be given throughout the term.

Unless otherwise indicated, all written submissions should be single-spaced, use a 12-point size font (Times family recommended), have one-inch margins, and be submitted as a word .DOC file via CTools (no e-mail, please). All documents should have a title that is pertinent to the content (not, MEMO 1), the name of the author(s), and have a footer that will have the name of the file, page, and EDUC 783-Fall 07. Label your file as follows <your LastName>_mm.dd (e.g., Mesa_9.15, indicates that Mesa posted the file on Sep 15). CTools will not accept late submissions. A special folder labeled, “Late Submissions” can be used when the time for submitting assignments has passed.

**Grading**

A letter grade (A, B, etc.) will be determined based on assessment of performance in each of the special forms of assessment plus class participation, as follows:

**Class participation.** Assessed considering attendance, responsible contribution to the class discussion (active listening and professional interventions), meeting the weekly reading assignment, and responding to the discussion questions. Class participation will count towards 20% of the final grade.

**Book review and discussion.** Assessed considering the connections with the analytical questions, the ability to highlight the main points of the book, and the creativity delivering the ‘radio’ report. This assignment will count towards 20% of the final grade.

**Debate.** Assessed considering originality, accuracy, and completeness of the information presented, and the ability to deal with the questions posed during the debate by the stakeholders. This assignment will count for 20% of the final grade. Being a group assignment, the final grade will be adjusted according to the level of contribution of each participant. Such contribution will be assessed at the end of the debate.

**Group research project.** The several stages outlined in the description will be considered in assessing students’ performance on this project. This assignment will count for 40% of the final
grade. Being a group assignment, the final grade will be adjusted according to the level of
contribution of each participant. Such contribution will be assessed throughout the duration of the
project, via a peer assessment form that will be tailored for the project.

A grade of A will be given to students who besides complying with the assignments and
deadlines provide thoughtful, creative, and original contributions to the class, provide evidence of
deep understanding of the material, and indications that are able to advance their own lines of
inquiry. Lower grades will be given when students comply unevenly with assignments, or show
partial interest on understanding the readings or assignments, do not suggest nor propose original
interpretations or innovative lines of inquiry. A failing grade will be given when students do not
comply with the assignments, deadlines, or fail to participate actively in understanding the material
or prevent other members of the class to accomplish the course goals.

**TEXTBOOKS AND OTHER READINGS**

The following texts are required:

This book provides us with theoretical principles for looking critically at curricula. It uses a
British reform project, the School Mathematics Project, (SMP) to illustrate those
principles.

Cambridge: Cambridge University Press.
A classic book on curriculum in mathematics education, it will give us useful principles to
look at curriculum development, and also a wealth of historical information of the status
of curriculum prior to the *Standards* reform. This book is out-of-print, but permission has
been obtained to reproduce it and use it for this course.

Mahwah, NJ: Erlbaum.
This book gives us examples of current *Standards*-based curricula, their origin,
implementation, and evaluation of effectiveness.

I marked these books as required because we will read more than half of each. DOW, and ST may
be obtained at Ulrich's Bookstore, 549 E. University (Phone: 662-3201) or through Amazon. HKK
will be available at Dollar Bill.

In addition, depending on their teaching interest, students are expected to become familiar with
either of the two following standards documents:

Reston, VA: Author.

Copies of the NCTM standards may be obtained from NCTM’s website or borrowed from faculty or advanced graduate students at U-M. The document may also be available for examination electronically. Useful web sites for NCTM documents and/or related materials: [http://standards.nctm.org](http://standards.nctm.org) and [http://forum.swarthmore.edu/mathed/nctm.new.pedagogy.html](http://forum.swarthmore.edu/mathed/nctm.new.pedagogy.html)

Copies of the AMATYC document are to be downloaded directly from their website, AMATYC.ORG.

Other readings—journal articles, chapters from reports and books—are assigned throughout the semester. A list of assigned readings for each week is contained in this syllabus. The readings may be obtained by locating the source document in one of the campus libraries or on the web. Alternatively, students may borrow a master copy from Sharon Laski [1360 SEB] for a limited period of time in order to make one personal copy of each assigned reading.

**Titles for Book Reviews**

The students will select the piece for reviewing from the following list. Students may borrow textbooks from the instructor or from the MTLT Library and the other books from the library:

**Books**


**Textbooks**

6. Everyday mathematics
7. Investigations
8. Connected Mathematics Project
9. Harvard Calculus
10. Core Plus Mathematics
11. Calculus by Stewart, Apostol, or Spivak
Schedule

The following is the plan for the course. The assigned reading is to be done before the corresponding class meets. All students are responsible for all the readings for a given session. A star (*) indicates that the article is available in electronic form, either in the Resources Folder in Ctools, or in the Library Reserves Link, or in the library Catalog. Post your answers to the discussion questions for each session in the discussion section of CTools by Monday at noon. Please read the Stanic and Kilpatrick paper prior to the first class.

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<tr>
<th>WEEK</th>
<th>DATE</th>
<th>CURRICULUM AND CURRICULUM DEVELOPMENT: PRESSURES, BARRIERS, STRATEGIES</th>
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<td>1</td>
<td>SEPTEMBER 4</td>
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Readings:


Discussion Question: What is your definition of curriculum? Explain how do the reading change (or not) that definition.

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<th>WEEK</th>
<th>DATE</th>
<th>HISTORICAL PERSPECTIVES OF THE SCHOOL MATHEMATICS CURRICULUM</th>
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<td>2</td>
<td>SEPTEMBER 11</td>
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Readings:

2. HKK: Chapters 1 & 2
3. ST: Chapter 1

Discussion Question: Which are, for you, the three most important milestones in the school mathematics curriculum? Why?

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<th>WEEK</th>
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<th>POLITICAL ASPECTS OF SCHOOL MATHEMATICS CURRICULUM</th>
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<tr>
<td>3</td>
<td>SEPTEMBER 18</td>
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Readings:

5. DOW: Chapter 3

Discussion Question: What are the advantages and disadvantages of curriculum tracking?

Final Project Memo 1 Due by 5 pm

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<th>WEEK</th>
<th>DATE</th>
<th>SCHOOL (MATHEMATICS) CURRICULUM THEORY</th>
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<td>4</td>
<td>SEPTEMBER 25</td>
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Readings:

8. DOW: Chapter 1
9. HKK: Chapter 5


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<tr>
<th>WEEK 5</th>
<th>OCTOBER 2</th>
<th>THE PRE-STANDARDS ERA: NEW MATH &amp; BACK TO BASICS</th>
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<tr>
<td>11.</td>
<td>HKK: Chapter 6</td>
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<td>12.</td>
<td>DOW: Chapter 4</td>
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Discussion Question: What could be the most significant lesson learned from the New Math and the Back to Basics reforms to our present-day understanding of school mathematics curriculum?

**Final Project Memo 2 Due by 5pm**

Time allotted for debate preparation

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<th>WEEK 6</th>
<th>OCTOBER 9</th>
<th>THE STANDARDS MOVEMENT</th>
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Readings:


Discussion Question: What could be the most significant lesson learned from the Standards reform to our present-day understanding of school mathematics curriculum?

| OCTOBER 16 | NO CLASS: FALL STUDY DAY |

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<tr>
<th>WEEK 7</th>
<th>OCTOBER 23</th>
<th>SCHOOL MATHEMATICS CURRICULUM REFORM: A DEBATE</th>
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Reading

## Week 8  October 30  U.S. vs. International School Mathematics Curricula

**Readings:**

20. DOW: Chapter 5 (pp. 87-104)


Discussion Question: Describe ways in which our notions of curriculum have changed as a result of having results on comparative studies of achievement available.

**Book review presentations:** Three presentations due today.

**Midterm Student Feedback.**

## Week 9  November 6  Teachers and School Mathematics Curriculum

**Readings:**

24. DOW: Chapter 5 (pp. 104-123)


Discussion Question: In which ways is Remillard’s model useful and not useful for conceptualizing teachers’ use of curriculum?

**Book Review Presentations:** Three presentations due today

## Week 10  November 13  Research on School Mathematics Textbooks and Curricula

**Readings:**

27. DOW: Chapter 6 (pp. 124-149)

28. ST: Chapters 4, 5, 9 & 14

Discussion Question: What are the strengths and weaknesses of the evaluation studies in ST?

**Book Review Presentations:** Three presentations due today

## Week 11  November 20  Research on School Mathematics Textbooks and Curricula

**Readings:**

29. DOW: Chapter 6 (pp. 150-169)


Discussion Question: Contrast the two approaches to textbook content analysis. What conclusions can be drawn from both?

**Final Project Draft Paper Due by 5pm**

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<th>WEEK 12</th>
<th>NOVEMBER 27</th>
<th>CURRICULUM DEVELOPMENT</th>
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**Readings**

33. DOW: Chapter 7

34. HKK: Chapter 4


Discussion Question: Contrast the description of curriculum development proposed by Batista and Clements with the process described in HKK and other of our readings (e.g., ST). How are they similar or different?

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<th>WEEK 13</th>
<th>DECEMBER 4</th>
<th>POSTER SESSION</th>
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In the first section of the class, we will hear from each presenter, ask questions and give feedback. In the second section, visitors will be invited to interact with the presenters.

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<th>WEEK 14</th>
<th>DECEMBER 11</th>
<th>CURRICULUM EVALUATION</th>
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**Readings**

36. DOW: Chapter 8

37. ST: Chapter 20

Discussion Question: What aspects of curriculum evaluation seem to be missing?

**Course evaluations**

**Final Paper Due at the beginning of class**