EDUC 711: RESEARCH IN MATHEMATICS EDUCATION
WINTER 2009

Instructor: Vilma Mesa, vmesa@umich.edu, 734 647 0628

Class Meeting Time: Tuesdays, 9am-12pm; Room: SEB 2328

NO CLASS APRIL 14, MAKE UP CLASS: FRIDAY APRIL 24, ROOM 2324

Web site: http://www.ctools.umich.edu/

Office Hours: Wednesdays 11am-1pm and by appointment, 1360F SEB

Description

In 1994, a number of leading researchers participated in an ICMI Study Conference addressing the questions 'What is research in mathematics education and what are its results?' After this conference, mathematics education was named a “domain of research in search of identity.” In this course we will explore a number of the issues highlighted in the ICMI study regarding research paradigms, researchable questions or problématiques, appropriate methods, relevant results, and criteria of evaluation of research.

In this course, students will become familiar with the current status of research in mathematics education spanning kindergarten to higher education and looking at national and international research. In addition, the course assists students in their work towards the preparation of their scholarly paper, guiding in reading, interpreting, and critiquing the literature relevant to their area of interest. Finally, the course will provide students with opportunities to develop their skills in critiquing research literature in the domain.

The course will be organized around clusters of problems, problématiques, general areas with which researchers tend to identify their work. For each cluster we will examine how researchers construct research questions in individual studies, how their designs address those questions, and how the findings feed the broader conversations in the cluster to which the study belongs. Historical accounts and comprehensive reviews of literature will be used to complement information in the field. Because the mathematics education program offers other courses in learning, teaching, and curriculum, these areas are tangentially addressed in the course.

Expectations and Grading Policy

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 readings prior to class, and participate actively in the discussions. Students are expected to inform the instructor, in advance, of absences.

Reading, discussion, and writing are critical components of this course, and as an advanced graduate level course, the reading load is substantial and the requirements for in-depth analysis are higher. It
is expected that students will come to class **having read all the assigned material thoroughly and thoughtfully and willing to share their understandings of the readings in order to contribute to the learning of all class members.** It is also expected that students will produce a considerable amount of writing and that they will improve their analytical and narrative skills as the course progresses. Unless otherwise indicated, all written submissions should be double-spaced, use a 12-point size font (Times family recommended), have one-inch margins, and **submitted as word (.doc or RTF) files.** All documents should have **title, header** (author and page number), and **footer** (name of the file, date, Winter-09). All file names should have EIGHT characters as follows:

- First three characters: 711
- Characters 4-5: Students’ first name and last name initials
- Characters 6-8: submission identifier, RM# for reflective memo, FP# for final paper, and # for the number of the submission.

Thus 711VMRM1.pdf indicates Vilma Mesa’s Reflective Memo 1. Students should become familiar with stylistic parameters set by the American Psychological Association (APA) and follow their guidelines very closely regarding citations, reference lists, quotations, and labeling of tables and figures. These guidelines are available in:


⚠️ It is expected that by the submission of the final paper, all students will have mastered these guidelines!

**Special Forms of Participation**

**Article Discussion:** Twice during the semester (once individually and once with a partner) each student will be responsible for leading the discussion of articles assigned for the day’s session and given in Table 1 below. The full reference for each article is given at the end of the syllabus. The objective of this assignment is to give the students the opportunity to develop skills in handling the discussion of texts in a graduate setting, an activity that they might face as scholars presenting their work in conferences or as instructors in a graduate program. The leader(s) will decide what questions to ask, how to make other students participate, and how to make sure students’ questions and misunderstandings have been addressed. Additionally, the leader(s) will summarize two other key articles referenced by the articles assigned explaining how these papers expand our understanding of the given cluster of problems. For this summary, the leader(s) may use no more than three power point slides that have sparse text, and use no more than 15 minutes. In preparation for the class discussion, the leader(s) should submit via CTools questions for the rest of the class to ponder as they prepare for the class, using the Discussion option. The questions should be posted by 5pm on Thursday, prior to the cluster class. The power point slides should be uploaded in Ctools prior to the beginning of the class in which they will be presented. Students are welcome to discuss their plans with the instructor as they prepare their discussion session. Students are expected to be very creative in encouraging discussion and participation by their classmates.
Table 1: Assigned Readings for Leading Article Discussion per Cluster of Problems.

<table>
<thead>
<tr>
<th>Cluster of Problems</th>
<th>Assigned Readings</th>
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**Reflective Memos:** Between two and four assignments will be distributed throughout the term with varied purposes (e.g., writing an abstract, writing a critique, responding to an argument made in class) and students will produce a short memo responding to the assignment. The length and scope will be determined at the moment the assignment is given. The memos should be posted in the CTools site by **5pm on Saturday** of the week in which it was assigned.

**Analysis of a dissertation.** To help students get acquainted with the norms of dissertation writing, each student will read one dissertation and two articles that have been delivered at research conferences that speak about a topic of interest. The student will produce a 3- to 5-page report regarding the nature of the questions asked, connections to the clusters, relationship between methods and questions, and other aspects worth mentioning. The report is due **February 20 at noon**.

**Journal Contents:** To help students get acquainted with the contents and orientation of journals that publish research in mathematics education, all students in the class working as a single group, will update a worksheet with abstracts and keywords for selected journals and summarize their content.
The Fall 06 class created the worksheet and we were granted permission to use their list for this class. The file is available in the resource folder of CTools, and contains for each article, a full reference, its abstract, the article’s keywords, and an ad-hoc categorization of the articles. You will first, update the worksheet, so that it contains the articles published since then, and then as a group, find a common categorization across publications and define each journal’s profile, their orientation, and changes observed in the publication years. On March 3, students will present a summary of their findings in a 30-minute presentation, in a format of their choosing.

**Final Paper:** Students working individually will produce a 10- to 15-page document (not including references) exploring an area of their interest using either one of the following formats:

- A conceptual analysis of a *research problem*, with substantive references to relevant literature, though not necessarily including a comprehensive review, with a description of the paradigms and methods used to address the particular problem and with a critique of those.

- A **comprehensive** review of a *domain of research* in mathematics teaching and learning with an indication of the sorts of problems open for investigation in the domain.

- A creative review of the literature that addresses a *phenomenon* in mathematics teaching and learning, which organizes the literature in such a way as to present an argument about the state of the field.

In producing this document, students in their second year are encouraged to talk to their advisors if they wish to use this activity as a springboard for their scholarly paper. Students should comply with the following plan:

- **Meeting to decide topic:** to be done within the first three weeks of class. Students will request a meeting with the instructor to discuss potential topics and relevant literature.

- **Topic and rationale:** Due by **5pm on Friday, January 30**, this two-page document will describe the area of interest and the rationale for conducting the search, as well as questions that the student hopes the paper will answer.

- **Draft of final paper:** Students will submit a draft of the final paper by **12 noon on Friday March 20**. Assume that this would be the paper that you would give to your advisor or to another colleague prior to submitting to a journal. I will give feedback that you may use as you prepare your final paper.

- **Final paper:** Students will submit their final paper on the **last day of class, Friday April 24, by 9am**. During this class, we will conduct a fire-house presentation by which each student is given five minutes to summarize their research, followed by 10 minutes of quick question and answer session by the participants.

**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), and meeting the weekly reading assignment requirement. Class participation will count towards 10% of the final grade.

**Article discussion.** Assessed considering the pertinence of the questions posed, the ability to handle the discussion, and the creativity in handling the class. This assignment will count for 25% of the final grade.

**Journal contents.** Assessed considering the coherence and insightfulness of the analysis and of the presentation, this assignment will count for 10% of the final grade. Because this is a group activity, students will be assessed both individually and collectively.

**Dissertation analysis.** Assessed considering the depth, quality, and creativity of the analysis. This paper will count towards 15% of the final grade.

**Reflective memos.** Assessed considering originality, accuracy, and depth of analysis. These assignments will make up 10% of the final grade.

**Final Paper.** The final paper will be assessed using the rubric shown in Figure 1 and will count towards 30% of the final grade. All students are advised to attend the Sweetland Writing Center [SWC] for advice in their writing. All graduate students have access to two hours of consultation per month. The faculty and staff who works there is extremely helpful.

| Each of the following aspects of the paper will receive a rating from 1 to 5. |
| (1 = Poor, 2 = Inadequate, 3 = Adequate, 4 = Good, 5 = Excellent) |

a. **THESIS:** A paper will receive a rating of 5 in this aspect when (i) it has a clear focus, (ii) there is a clearly articulated research question, (iii) there is an adequate rationale for studying the question, and (iv) implications of the findings are outlined. Lower ratings will be given when these elements are missing or poorly portrayed.

b. **DEVELOPMENT:** A paper will receive a rating of 5 on this aspect when (i) the argument is adequately developed; (ii) it includes warrants for the assertions given, (iii) relevant literature and appropriate and accurate quotes are used, (iv) accurate summaries are provided, and (v) the significance of quotes is provided. Lower ratings will be given when these elements are missing or poorly articulated.

c. **ORGANIZATION:** A paper will receive a rating of 5 on this aspect when (i) the paper is structured logically following a coherent outline and (ii) the paragraphs are cohesive.

d. **CLARITY & STYLE:** A paper will receive a rating of 5 when it (i) uses language that is clear, accurate, and adequate for an audience of researchers; (ii) complies with the APA guidelines for citations, referencing, and quotations; (iii) uses a professional tone in reporting and critiquing; and (iv) is free from grammar, spelling, and typographical errors. Lower ratings will be given when any of these elements are missing.

e. **COMPLIANCE:** A paper will receive a rating of 5 when it (i) follows the guidelines for the assignment, (ii) follows guidelines for formatting (including font, margins, labels for files); (iii) is turned on or before the deadline; and (iv) includes appendices as needed. Lower ratings will be given when any of these elements are missing.
Full credit for each assignment will be awarded 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 in understanding the readings or assignments and 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 book is required for this class:


The following textbooks are optional:


These books are available in Ulrich’s.

Additional readings have been made available through the university’s Reserves system and the resources folder in CTools. Students can access other articles not found there through the library system from any campus computer connected to the University electronic network. The readings for the cluster of problems are given following the class schedule.

**SCHEDULE OF CLASS MEETINGS, TOPICS, AND ASSIGNED READINGS**

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. Cluster readings are listed in Table 1. A star (*) indicates that the article is available on-line via the library reserves link in CTools. It is a good practice to keep a good system for annotating references and a journal in which you write down questions, ideas, or insights you have gained. These notes will be very useful as you gain understanding and knowledge about the main ideas we will be discussing.

**Session 1, January 13: Identity Search & Problematiques**

Read:


[S] Chapter 1, pp. 1-25
Reflect, Research & Write:

1. Before reading the papers anticipate what do you think they are about. Jot down some ideas.
2. Who are the authors? Where are they? What ‘credentials’ they have for editing the book? Find their pictures.
3. E-mail up four clusters of interest for leading the discussion. Rank them in order of preference.

Session 2, January 20: The literature review as a genre

Read:


Reflect, Research, & Write:

1. What makes these papers ‘literature reviews’? Notice that this is a question that requires of you more than to say: they ‘review’ the literature. What is special about the review as a genre?
2. Who are the authors? Where do they work? What are their current research areas? Find their pictures.
3. What connections do you see between the Stokes chapter and these reviews?

Session 3, January 27: The nature of research

Read:


Reflect, Research, & Write:

1. Before reading, define epistemology. Define the term again after you have read both pieces.
2. Who is Gregory Kelly? What are his current research areas? Find his picture.
3. Define the connection between ‘epistemology’ and ‘ontology’ and ‘methodology.’

January 30: Topic and rationale for final paper due by 5PM

Session 4, February 3: Cluster 1-Students’ construction of mathematical ideas

Read:


Cluster discussion led by: ____________________________________________________

Reflect, Research, & Write:
1. BCP deals with a series of ‘logics.’ Identify them and write your understanding of those terms using the text and your own prior interpretations of the terms.

2. Find information about Bourdieu, Comte, and Bachelard, and other people mentioned in the reading. Find their pictures.

3. Address the questions posted by the cluster leaders.

**Session 5, February 10: Cluster 2 - The work of the teacher**

Read:
[BCP] Introduction, pp. 3-6
Cluster discussion led by: ________________________________

Reflect & Write:
1. Clarify the expressions *ars inveniendi* and *ars probandi*
2. Address the questions posted by the cluster leaders.

**Session 6, February 17: Cluster 3 - Communication in mathematics classrooms**

Read:
[BCP] Introduction, pp. 6-12 & 91-92
Cluster discussion led by: ________________________________

Reflect, Research, & Write:
1. Summarize BCP’s thesis regarding the distinction between the social sciences and natural sciences epistemologies
2. Address the questions posted by the cluster leaders.

**February 20: Dissertation Analysis Due**

**Session 7, March 3: Cluster 4 - Mathematical tasks**

Read:
[S]: Chapter 4, pp. 90-110.
Cluster discussion led by: ________________________________

Reflect, Research, & Write:
1. Up to this point we have heard BCP’s position distinguishing the work in social sciences as opposed to that in the natural sciences. Stokes will now reveal the ‘new paradigm.’ Critically read Stoke’s chapter in light of BCP’s position.
2. Address the questions posted by the cluster leaders.

**Journal Content Due**
Session 8, March 10: Cluster 5-Mathematical ways of knowing in and out of school

Read:

Cluster discussion led by: ________________________________

Reflect, Research, & Write:
1. So far we have seen different types of designs in the papers we have read. How do they compare to the ‘design experiments’ defined by Schoenfeld?
2. Find about Schoenfeld, his past and present work, some contributions, his picture.
3. Address the questions posted by the cluster leader(s).

Session 9, March 17: Cluster 6-Equity in and access to mathematics learning

Read

Cluster discussion led by: ___________________________________________

Reflect, Research, & Write:
1. Start by reading the illustrative texts. Summarize the main important points in each. Then read the main section. Establish the connection between the section and the exemplary texts.
2. Address the questions posted by the cluster leaders.

MARCH 20: DRAFT OF FINAL PAPER DUE BY 12 NOON

Session 10, March 24: Cluster 7-Socio-political dimensions of school mathematics

Read:
[S]: Chapter 5, pp. 111-152.

Cluster discussion led by: ___________________________________________

Reflect, Research, & Write:
1. Who is Margared Eisenhart? Where does she work? Find a picture.
2. The question of representation is clearly not particular to qualitative data. Comment on how Eisenhart’s notion of representation can be extended to quantitative data.
3. Address the questions posted by the cluster leader(s).

Session 11, March 31: Cluster 8-Undergraduate mathematics education

Read:
Cluster discussion led by: __________________________________________________

Reflect, Research, & Write:
1. Find the most important contributions by Dick Lesh and Anthony Kelly. Find their pictures.
2. We have seen a few instances of these teaching experiments. What is different and what is similar to the notion of ‘experiment’ in the natural sciences? Where do these teaching experiments stand regarding BCP’s *ars inveniendi* and *ars probandi*.
3. Address the questions posted by the cluster leader(s).

**Session 12, April 7: Cluster 9-Curriculum evaluation**

Read:

Cluster discussion led by: __________________________________________________

Reflect, Research, & Write:
1. Find information about Linda Crocker; where she works, her picture, her areas of research.
2. In which ways Crocker’s information about measurement was taken into account in the evaluation of curriculum papers?
3. Address the questions posted by the cluster leader(s).

**APRIL 14: NO CLASS, AERA**

**Session 13, April 21: Synthesis**

Read:


Course evaluations
Reflect, Research, & Write:
1. The two pieces offer a different view of mathematics education as a research endeavor. Identify those views.
2. How do these compare with the Sierpinska, Kilpatrick, & Bishop piece we read for the first day of class?
3. How do they fit with Stoke’s & Bourdieu et al.’s tenets?
References


Leinhardt, G., Zaslavsky, O., & Stein, M.K. (1990). Functions, graphs, and graphing: Tasks, learning,


