

GEORGE MASON UNIVERSITY
College of Education & Human Development
Graduate School of Education
Mathematics Education Leadership

Course Title: Research in Mathematics Teaching
Program Code: EDCI 666 001 (3 credits)
Spring 2010

Instructor:	Dr. Margret Hjalmarson	Office Hours: By appointment
Office Phone:	(703) 993-4818	
Office:	207A Commerce II Bldg.	Class Meets: Weds, 4:30-7:10
Email:	mhjalmar@gmu.edu	Innovation Hall 316

I. Course Description

Research seminar for Master's level students in the Mathematics Specialists Leader Program and Mathematics /Science Education Leadership cohort program. Students survey the most current research literature in mathematics education and engage in research, study, and discussion of teaching and learning mathematics in school settings.

Prerequisite: Admission to the Mathematics Specialists Program, Mathematics/Science Education Leadership Master's Degree Program or Permission of the Instructor.

II. Student Outcomes

At the conclusion of this course, students should be able to:

- A. Read, interpret, critique and synthesize research on teaching and learning mathematics in classroom settings.
- B. Develop an annotated bibliography that shows an in-depth knowledge base of research in mathematics education.
- C. Articulate a position on mathematics education issues grounded in research.
- D. Present an analysis and summary of research in one specific area of mathematics education.

III. Relationship to Program Goals and Professional Organization

EDCI 666 is designed to enable mathematics education leaders to read, interpret, and evaluate issues in mathematics education research that impact mathematics teaching and learning. 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 Graduate Programs in Mathematics Education.

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

- Demonstrate knowledge of historical, social, political, and economic factors impacting mathematics education,
- Critique research reports,
- Synthesize research results,
- Interpret research findings for practitioners,
- Communicate research results clearly to a variety of audiences, and
- Demonstrate knowledge of current and historical research in mathematics teaching and learning including technology and diversity.

IV. Nature of Course Delivery

The delivery of this course combines methods of lecture, in-class discussion, on-line discussion, independent study/research, student presentation, and writing.

V. Texts and Readings

Recommended:

NCTM Student Membership. Provides access to (1) Online subscription to *Teaching Children Mathematics* (for the elementary grades) or other school journals, and (2) Online NCTM 2000 *Principles and Standards for School Mathematics*; available from the National Council of Teachers of Mathematics, 1906 Association Drive, Reston, VA 22091; 703-620-9840; www.nctm.org website.

Required:

Access to the Internet and the GMU Blackboard website

<http://blackboard.gmu.edu>

Required Texts:

1. Mason, J. (2002). *Researching your own practice: The discipline of noticing*. New York: Routledge.
2. National Council of Teachers of Mathematics. (2003). *A Research Companion to Principles and Standards for School Mathematics*. J. Kilpatrick, W.G. Martin, and D. Schifter (Eds.). Reston, VA.

VI. Course Requirements, Assignments, & Evaluation Criteria

The assignments across the semester are intended to develop skills in the interpretation, critique and synthesis of mathematics education research. Students interpret research findings and communicate research results appropriate for a variety of audiences. All assignments are to be completed on time so that class members might benefit from the expertise and contributions of their colleagues.

A. Research Synopsis Assignments (20%)

Synopsis – “A brief statement or outline of a subject; similar to an abstract.”

A synopsis should be 3-4 pages in length, 12 pt font, double-spaced.

In this assignment you will write a synopsis of three mathematics education research articles from two different resource journals.

Synopsis #1 – Select a mathematics article from the *Journal for Research in Mathematics Education*, a top research journal in mathematics education published by NCTM. (10%)

Synopsis #2 – Select a mathematics article from *Educational Studies in Mathematics*, a top international research journal in mathematics education or from another research journal. (10%)

Each SYNOPSIS should include the following items in order: (1) APA Citation of the Article, (2) Research Question, (3) Participants, (4) Procedures/Data Collection Methods, (5) Analysis, (6) Results, and (7) Impact/Connections.

B. Research Expertise Presentation (30%)

Mathematics education research often focuses on key areas or topics. This allows scholars to develop an understanding of the body of knowledge that has accumulated in a particular area of mathematics. The purpose of this assignment is to develop your expertise in one specific area of mathematics that is of interest to you. First, write a research question that is of interest to you and why that is of interest to you in

mathematics teaching and learning. Select FIVE research articles that focus on the SAME topic in mathematics. Prepare a summary of the articles that includes the following information: Use APA format to cite the articles and write a summary (abstract length) of each article that includes: (1) APA Citation of the Article, (2) Research Question, (3) Participants, (4) Procedures/Data Collection Methods, (5) Analysis, (6) Results, and (7) Synthesis of How the Studies Confirm or Refute the Others.

Use PowerPoint to present a summary of the five studies to your peers during a class session. You should present this information as the “expert” on this particular topic in mathematics. The following issues should be addressed in your presentation: How does the issue impact the teaching and learning of mathematics? How does the issue impact parents, teachers, and students? How does the issue impact assessing students’ understanding of mathematics? How will the issue impact mathematics classrooms of the future? What role does the issue play in your personal theory about the mathematics teaching and learning process? Provide a copy of your research abstracts for the instructor. The length of each individual abstract summary should be 1-2 pages, making all of the abstracts 5-10 pages in length. Your powerpoint and abstracts should be posted to the discussion board on the course Blackboard site.

C. Annotated Bibliography of Course Readings (20%)

In this assignment students present evidence of their Academic Readings by creating an Annotated Bibliography. To create the Annotated Bibliography students should select 15 readings from the course to include in the bibliography. The Annotated Bibliography should include a brief description of the content of the book(s), article(s) or other readings. Annotations should be **brief** (approx. 2 paragraphs in length), but of sufficient length to convey to a reader (whether familiar or not familiar with a particular citation) that the student has captured the essence of the material in the reading.

*Each annotation should contain a minimum of five key points from the reading.

*Implications to teaching and learning.

Bring to class each time for discussion and turn in compilation electronically by May 6th

D. Action Research Exercises (20%)

Throughout the semester, students will be assigned exercises to develop skills for action research. Topics will often be selected from *Noticing Your Own Practice* to accompany the reading for that week but may be drawn from other sources. Students will be responsible for completing the exercise and posting it to the discussion board in Blackboard prior to the start of class.

E. Data Collection Instrument Assignment (10%)

You are to locate a published data collection instrument (e.g., survey, problem set, interview protocol) which could be used in an action research project in mathematics for your grade level. Bring a copy of the instrument to class to show other class members. Write a 1-2 page paper detailing the (a) source (who developed it and Copy of the article that used the instrument) and cost of the instrument (complete address of the source is required), (b) purpose of the instrument, (c) intended grade levels of the instrument, and (d) how you might use this instrument (or a modified version of it) in an action research project. The instrument can be used to collect either quantitative or qualitative data. This instrument will be shared with the class in the next class. Before class, you are to post this paper to Blackboard.

Evaluation Criteria

Graduate Grading Scale

A	93%-100%	B+	87%-89%	C	70%-79%
A-	90%-92%	B	80%-86%	F	Below 70%

VII. Course Schedule - Class meets Wednesday 4:30-7:10 PM

Spring 2010 CALENDAR

DATE	READINGS (Topics for Discussion)	ASSIGNMENTS
January 20	FOCUS: Beginning to notice our practice	Self-inventory
January 27	RESEARCH FOCUS: STATE OF SCHOOL MATH IN THE US /TIMMS <i>Noticing – Chapter 1</i> <i>Research Companion -Chapter 1, 2</i>	Discussion Leaders: _____ _____
February 3	RESEARCH FOCUS: STRANDS OF MATHEMATICS PROFICIENCY <i>Adding it Up – Chapter 3 & 4</i> <i>Research Companion – Chapter 3</i>	Discussion Leaders: _____ _____
February 10	RESEARCH FOCUS: TEACHER KNOWLEDGE, ASSESSMENT, & STUDENT MATHEMATICAL POWER <i>Noticing – Chapter 2, 3 & 4</i> <i>Research Companion Chapters - 4 & 5</i>	Discussion Leaders: _____ _____
February 17	RESEARCH FOCUS: DEVELOPING PROFICIENT WITH WHOLE NUMBERS/ Cognitive guided Instruction <i>Research Companion – Chapter 6 & 8</i> <i>Noticing – Chapter 5 & 6</i>	Research Synopsis #1 DUE Discussion Leaders: _____ _____
February 24	Research Instruments Activity You are to locate a published data collection instrument which could be used in an action research project in mathematics for your interest area <i>Noticing – Chapter 7</i>	
March 3	RESEARCH FOCUS: DEVELOPING PROFICIENCY WITH OTHER NUMBERS: RATIONAL NUMBER PROJECT <i>Ma (1999)</i> <i>Saxe (1988)</i>	<u>Discussion Leaders:</u> _____ _____

	<i>A Research Companion - Chapter 7</i>	
March 10	Spring break – NO CLASS	
March 17	RESEARCH FOCUS: ALGEBRA <i>Research Companion – Chapter 10 Bastable & Schifter (2008)</i>	Discussion Leaders: _____ _____
March 24	RESEARCH FOCUS: GEOMETRY, MEASUREMENT <i>Research Companion - Chapter 11 & 12 Shaughnessy & Burger (1985)</i>	Research Synopsis #2 DUE <u>Discussion Leaders:</u> _____
March 31	RESEARCH FOCUS: DATA ANALYSIS & PROBABILITY <i>A Research Companion - Chapter 13 & 14</i>	Discussion Leaders: _____ _____
April 7	RESEARCH FOCUS: REASONING & PROOF <i>A Research Companion - 15</i>	Discussion Leaders: _____ _____
April 14	RESEARCH FOCUS: COMMUNICATION & REPRESENTATIONS/ Math Talk Examining student work <i>A Research Companion - Chapter 16</i>	<u>Discussion Leaders :</u> _____
April 21	RESEARCH FOCUS: DEVELOPING REPRESENTATIONAL FLUENCY <i>A Research Companion - Chapter 18, 19</i>	Discussion Leaders: _____ _____
April 28	RESEARCH FOCUS: PERSPECTIVES ON TEACHING AND LEARNING Technology and Mathematics Addressing diverse learners <i>Selected reading from instructor</i>	Research Expert Presentations Due
May 5	Finals week/Project Presentation	Research Expert Presentations Annotated Bibliography DUE

VIII. UNIVERSITY POLICIES

The College of Education and Human Development (CEHD) expects that all students abide by the following:

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. Students must follow the guidelines of the University Honor Code. See http://www.gmu.edu/catalog/apolicies/#TOC_H12 for the full honor code.

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. Students with disabilities who seek accommodations in a course must be registered with the GMU Disability Resource Center (DRC) and inform the instructor, in writing, at the beginning of the semester. See www.gmu.edu/student/drc or call 703-993-2474 to access the DRC.

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).

PROFESSIONAL BEHAVIOR & DISPOSITIONS

Students are expected to exhibit professional behavior and dispositions. See www.gse.gmu.edu for a listing of these dispositions.

Students must agree to abide by the university policy for Responsible Use of Computing. See <http://mail.gmu.edu> and click on Responsible Use of Computing at the bottom of the screen.

The university has a policy that requests students to turn off pagers and cell phones before class begins.

Approved March 2004

EDCI 666
RESEARCH SYNOPSIS ASSIGNMENTS

Understanding, Interpreting, and Evaluating Mathematics Education Research

SYNOPSIS – “A brief statement or outline of a subject; similar to an abstract.”

A Synopsis should be 3-4 pages in length, 12 pt font, double-spaced, with headings.

In this assignment you will write a synopsis of three mathematics education research articles from three different types of resource materials. You will make an informal presentation to the class about the information in the article.

Each SYNOPSIS should include the following items in this order:

1. APA Citation of the Article – At the beginning of the synopsis, include the APA citation (5th edition) of the article.
2. Research Question – What research question did the researchers attempt to answer in this study?
3. Participants – Who participated in the research study? Teachers or students? What grade level or other information do you know about the participants?
4. Procedures/Data Collection Methods – What data was collected during the study? How was the data collected (assessment tests, video or audio tapes, interviews, observations, surveys, etc.)?
5. Analysis – How was the data analyzed after it was collected? Did the researchers use qualitative or quantitative methods of analysis?
6. Results – What did the study conclude? What information was presented by the researchers as the outcomes in the study? What recommendations did the researchers make to teachers/educators/researchers?
7. Impact/Connections – How does this study connect to your teaching of mathematics? What impact might the results have on your teaching of mathematics? How does the issue impact the teaching and learning of mathematics in your classroom, your school, or your school system? How does the issue impact parents, teachers, and students? How does the issue impact assessing students’ understanding of mathematics? How will the issue impact mathematics classrooms of the future? What role does the issue play in your personal theory about the mathematics teaching and learning process?

Synopsis #1

Journal for Research in Mathematics Education is a top research journal in mathematics education. Articles in this journal focus primarily on mathematics education research studies. Select one article from this journal.

Synopsis #2

Educational Studies in Mathematics is a top international research journal in mathematics education. Articles in this journal focus primarily on mathematics education research studies. Select one article from this journal.

RUBRIC FOR RESEARCH SYNOPSIS ASSIGNMENTS
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Criteria	Meets Requirements (A, A-)	Needs Improvement (B+, B, C)
APA Citation of the Article	The APA citation appears at the beginning of the synopsis assignment; The citation follows all requirements in the APA manual (5 th edition).	The APA citation does not appear at the beginning of the synopsis assignment OR; The citation is missing one or more requirements in the APA manual (5 th edition).
Research Question	The synopsis clearly identifies the question or questions investigated in the study.	The question is not stated clearly; OR there are two or more questions and the synopsis only identifies one; OR the question in the synopsis does not match the question investigated in the study.
Participants	The synopsis describes in detail who participated in the research study; It includes complete descriptive information about the participants (such as the grade level, age, gender, race, academic ability level, number of years teaching experience, etc.).	The synopsis tells who participated in the research study; It does not go into detail about the participants; Additional descriptive information could have been provided about the participants from the descriptions in the study.
Procedures/Data Collection Methods	The synopsis thoroughly describes the data that were collected during the study and how those data were collected; It provides an accurate description with specific examples of the data collection procedures; It is a thorough outline of the data sources (such as assessment tests, video or audio tapes, interviews, observations, surveys, etc.); It is a complete outline of the procedures (2-week workshop, repeated measures design, year-long observations in a math class, etc.).	The synopsis describes the data that were collected during the study and how those data were collected; It provides some examples of the data collection procedures; The synopsis may be too brief or may not thoroughly detail all of the data collection methods and procedures.
Analysis	The synopsis describes in detail how the data was analyzed after it was collected; It identifies if the researchers used qualitative or quantitative methods of collection and analysis; It gives examples such as “coded using a constant comparative method,” or “analyzed using a qualitative software package,” or “descriptive statistics, a t-test, and an analysis of variance were used.”	The synopsis provides some information about how data were analyzed; The synopsis may be too brief or may not thoroughly detail all of the procedures of analysis used by the researchers.
Results	The synopsis provides a clear and concise summary of the results of the study; It gives the reader summative information about what the researchers concluded in the study; It provides specific information about the recommendations the researchers make to teachers, educators, and other researchers.	The synopsis provides a summary of the results of the study; It gives the reader information about what the researchers concluded in the study; It provides information about the recommendations the researchers make to teachers, educators, and other researchers; It may not be concise or it may lack information about specific conclusions made by the researchers.
Impact/Connections	The synopsis addresses the following information relevant to the study – It shows how this study connects to your teaching of mathematics; It tells what impact the results might have on your teaching of mathematics; It describes how the issue impacts the teaching and learning of mathematics in your classroom, your school, or your school system; It outlines how the issue impacts parents, teachers, and students; It describes how the issue impacts assessing students’ understanding of mathematics; It details how the issue impacts mathematics classrooms of the future; It describes what role the issue plays in your personal theory about the mathematics teaching and learning process.	The synopsis may be too brief or may not thoroughly discuss all of the pertinent issues and connections of the article as they relate to teaching and learning mathematics in classrooms.
Professional Writing Quality	The synopsis follows professional standards of writing and is free of spelling, grammar, and language mechanics errors.	The synopsis contains spelling, OR grammar, OR language mechanics errors.

