

9/25/2015

GEORGE MASON UNIVERSITY  
(GMU)  
COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT  
(CEHD)  
EDPD502: Inquiry-Based Mathematics Instruction in Grades K-2  
Spring/2015  
Monday/4:30-7:30 PM  
January 12 – May 18, 2015  
Edward L. Kelly Leadership Center/Room 2002-2004

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**COURSE DESCRIPTION:** (35 words or less; should begin with a verb)

Using research in early numeracy and applications with young children with diagnostic assessments and videotaped lessons, this course will increase teachers' content knowledge and pedagogical background needed to teach effectively in an inquiry-based mathematics classroom.

**COURSE PURPOSE AND INTENDED AUDIENCE:**

Results of national and international assessments in mathematics achievement point to the need for reform of mathematics instruction for elementary students. This course is designed to increase teachers' knowledge of mathematics and the hierarchy of sophistication of children's strategies in early numeracy.

*Inquiry-Based Mathematics Instruction in grades K-2* is based on the principles of both *Math Recovery* and *Assessing Math Concepts*. It involves a comprehensive study of early

9/25/2015

numeracy and its application in an inquiry-based classroom. The primary focus of this 3-credit graduate course is to increase both the content knowledge of teachers and the pedagogical background needed to teach effectively in an inquiry-based mathematics classroom. The course relies heavily on recent research in numeracy and builds from diagnostic assessments developed by Wright, Stafford, and Martland and by Kathy Richardson. The assessments focus on the sophistication of strategies students use to solve problems in the area of early numeracy. Teachers will develop ease with assessments to diagnose difficulties in mathematics and strategies to remediate these difficulties. Through readings, activities, discussions, and online modules, teachers will learn to develop in-depth understanding of student thinking about number concepts. During this class, teachers will learn research-based methods for teaching mathematics for understanding and will videotape their work with students on assessments and activities.

#### **COURSE FORMAT:**

Class meetings will be structured for maximum teacher participation. Each class will begin with discussion of mathematical topics and readings. The focus of the mathematical content will be based on the readings assigned. Mathematical problems, activities, and lessons supporting these concepts will be modeled, practiced, and discussed.

#### **STUDENT OUTCOMES:**

The primary focus of this course is to increase both the content knowledge of teachers and the pedagogical background needed to teach effectively in an inquiry-based mathematics classroom. Teachers will develop ease with assessments to diagnose difficulties in mathematics and with research-based methods for remediating these difficulties and for teaching mathematics for understanding. Through readings, activities, discussions, and online modules, teachers will learn to develop in-depth understanding of student thinking about number concepts. Teachers will videotape their work with students on assessments and related activities/lessons.

9/25/2015

## Course Objectives

Upon completion of the course, participants will

- Have a working knowledge of assessment instruments designed to determine students' stages and levels of mathematical knowledge of numeration and computation in grades K-2;
- Focus their attention on children's strategies used to solve problems;
- Learn strategies for teaching, remediating, and enriching concepts of early numeracy;
- Have a working knowledge of the latest research in best practices for mathematics instruction for young children.

PROFESSIONAL STANDARDS (if applicable):

National Board for Professional Teaching Standard, Core Proposition 2

INTASC Standard \_\_ \_ \_ \_

TESOL Standard \_\_\_\_\_

## REQUIRED/SUPPLEMENTAL/RECOMMENDED TEXTS AND/OR READINGS:

Required Texts (Provided free of charge to all enrolled participants)

Kilpatrick, Jeremy and Swafford, Jane (Ed.) (2002). *Helping Children Learn Mathematics*. Washington, DC: National Research Council.

Richardson, Kathy. (2012). *How Children Learn Number Concepts: A Guide to the Critical Learning Phases*. Bellingham, Washington: Math Perspectives Teacher Development Center.

Wright, Robert J. et al. (2006). *Teaching Number in the Classroom with 4-8 Year Olds*. London: Paul Chapman Publishing.

### Supplemental Texts

Chapin, S.H. and Johnson, A. (2006). *Math Matters: Understanding the Math You Teach Grades K-8*. Sausalito, CA: Math Solutions Publications.

Wright, Robert J. et al. (2006). *Early Numeracy: Assessment for Teaching and Intervention*. London: Paul Chapman Publishing.

Wright, Robert J. et al. (2006). *Teaching Number: Advancing Children's Skills and Strategies*. London: Paul Chapman Publishing.

### Recommended Reading

Selected readings pertaining to early mathematics acquisition and instruction from a variety of sources, including *Teaching Children Mathematics* {NCTM} and *Journal for Research in Mathematics Education* (NCTM).

9/25/2015

## COURSE REQUIREMENTS, PERFORMANCE-BASED ASSESSMENTS, EVALUATION CRITERIA, AND GRADING SCALE:

**Activity/Assessment Discussion Leader** – Complete and reflect on an activity and/or assessment from the text.

During the course of the semester, each participant will be responsible for reading about and doing one activity/assessment from an upcoming chapter in the text. Results and reflections on the reading and activity/assessment (including discussion of relevance to the teacher's professional growth, changes in student behavior, and student mathematical growth) will be posted to the MAT 220.1 Staff Communities Discussion Forum.

**Reading Responses** – All participants will read and respond in writing on the Discussion Forum to reflections posted by at least two Discussion Leaders per week. Reading responses will include relevance to the teacher's professional growth, possible changes in their own students' behavior, and mathematical growth that might occur with their students **if** ideas in the reading(s) are implemented. All points in reflections must be supported, informally, with references from the article.

**Research Update** – Share readings and research on topics of personal interest.

For designated class periods, participants will be required to bring an article or other independent reading to the attention of the class, drawn from current research, teaching, or commentary in mathematics education, to be shared and discussed as a class or in groups.

**Assessment and Activity Videos** – Videotape administration of one *Math Recovery* and one *Assessing Math Concepts* Assessment and instruction using related activities.

Videos and reflection/commentary will be shared with the class for discussion.

### End of Course Project Options

A. **Inquiry-Based Guided Math Plan and Summary** – Write a plan for an inquiry-based guided math class, conduct the class, and write a reflection upon completion.

Plan will be written in one of a choice of formats provided or selected by the teacher and will be conducted within a specified timeframe. Reflection should be an informal description of the actual class after it is completed. Particular emphasis should be placed on the teacher's professional pedagogical growth, including unexpected occurrences or outcomes, what would be done differently if done again, future plans for similar/different guided math class, etc.

OR

B. **Mini-Conference Presentation** - Develop a 10-15 minute presentation, in the form of a conference presentation.

The presentation will be on a topic of interest to the presenter that is relevant to the course and participants. The presentation will be prepared and delivered to the class, and should include any presentation materials necessary to accomplish the objectives of the presentation. Participant should be engaged in activities that are relevant and productive to the objectives of the course. Follow-up reflection by the presenter should include discussion of presenter's growth as a result of planning and presenting the session, description of unexpected outcomes or occurrences, what would be done differently if the session were presented again, etc.

9/25/2015

Evaluation Criteria – Each assignment will be evaluated based on an *assignment-specific rubric*. Rubrics will be provided to students at the first class.

(EXAMPLE)

RUBRIC FOR STANDARDS-BASED GUIDED MATH CLASS ASSIGNMENT

MAT 220.1

(15 points)

PARTICIPANTS WILL COMPLETE A GUIDED MATH CLASS ASSIGNMENT  
BY CLASS 14, MAY 18, 2015.

Criteria	Meets Requirements (A, A-)	Needs Improvement (B+, B, C)
Lesson Plan	The plan includes all/most criteria for a standards-based guided math class: SOL(s) addressed; assessment (including prior knowledge, formative, &/or summative, as appropriate); task analysis; important vocabulary; key/guiding questions; instruction, including framing the lesson, learning experiences, differentiation, resources; reflection on lesson, including analysis of student learning, monitoring/adjusting instruction, future planning.	The plan is not complete, does not include some or all criteria for a standards-based, guided mathclass.
Complete Description of Instruction	Description of class as taught includes details related to all aspects covered during the class, including decisions about grouping and activities, tapping into prior knowledge, teacher's role in instruction, students' role(s) and responses, how students were assessed (formative &/or summative).	Description of class is not complete, lacks details related to some or all aspects of the class.
Timeframe	Class was conducted within the timeframe allotted, i.e. completed by May 18, 2015 deadline.	Class was not conducted prior to May 18, 2015 deadline.
Lesson Reflection	Reflection on actual class includes discussion of teacher's pedagogical growth as a result of planning and teaching the class, description of unexpected outcomes or occurrences, what would be done differently if the class were taught again.	Reflection is not complete, does not address some or all of the criteria required.

COMMENTS:

9/25/2015

**GRADING SCALE:**

A=93%-100%=225-242 points

A-=90%-92%=217-224 points

B+=87%-89%=210-216 points

B=83%-86%=200-209 points

B-=80%-82%=193-199 points

C=70%-79%=169-192 points

F=Below 70%=<169 points

**GEORGE MASON UNIVERSITY COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT STATEMENT OF EXPECTATIONS:**

The Graduate School of Education (GSE) expects that all students abide by the following:

Students are expected to exhibit professional behavior and dispositions. See [gse.gmu.edu](http://gse.gmu.edu) for a listing of these dispositions.

Students must follow the guidelines of the University Honor Code. See [http://www.gmu.edu/catalog/apolicies/#TOC H12](http://www.gmu.edu/catalog/apolicies/#TOC_H12) for the full honor code.

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.

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](http://www.gmu.edu/student/drc) or call 703-993-2474 to access the DRC.

9/25/2015

**MAT 220.1 CLASS SCHEDULE Spring 2015**

**LAST DAY TO DROP CLASS WITHOUT ACADEMIC PENALTY IS BEFORE 20% OF THE CLASS SESSIONS HAVE MET (NLT Jan. 26, 2015).**

CLASS	DATE	TOPIC/LEARNING EXPERIENCES	READINGS/ASSIGNMENTS
1	Jan. 12	The Teacher as a Learner Introduction: The Critical Learning Phases <i>Landscape of Learning</i>	Read <i>Teaching Number</i> Ch. II Read <i>How Children Learn</i> p. v-vi and Introduction
2	Jan. 26	Mathematical Proficiency Number Words and Numerals	Read <i>Teaching Number</i> Ch. 3 Respond to Class 1 posting Research Update #1
3	Feb. 2	Understanding Counting	Read <i>How Children Learn</i> Ch. 1 Respond to Class 2 posting Research Update #2
4	Feb. 9	Understanding Number Relationships	Read <i>How Children Learn</i> Ch. 2 Respond to Class 3 posting Assessment Video # 1
5	Feb. 23	Approaching, Organizing, and Designing Instruction (prep for <u>Activity</u> Video) Early Counting and Addition	Read <i>Teaching Number</i> Ch. 1 and 4 Respond to Class 4 postings Research Update #3
6	Mar. 2	Structuring Numbers I to IO	Read <i>Teaching Number</i> Ch. 5 Respond to Class 5 postings Activity Video # 1
7	Mar. 7	BNVCTM Conference	Conference Reflection (due 3/16)
8	Mar. 16	Understanding Addition and Subtraction: Parts of Numbers	Read <i>How Children Learn</i> Ch. 3 Respond to Class 6 postings Conference Reflection
9	Mar. 23	Understanding Place Value: Tens and Ones	Read <i>How Children Learn</i> Ch. 4 Respond to Class 8 postings Research Update #4
10	Apr. 6	Advanced Counting: Addition and Subtraction	Read <i>Teaching Number</i> Ch. 6 Respond to Class 9 postings Research Update #5
11	Apr. 20	Structuring Numbers I to 20	Read <i>Teaching Number</i> Ch. 7 Respond to Class 10 postings Assessment Video #2
12	Apr. 27	Understanding Place Value: Hundreds, Tens, and Ones	Read <i>How Children Learn</i> Ch. 5 Respond to Class 11 postings Research Update #6
13	May 5	2-digit Addition and Subtraction: Jump Strategies <b>and</b> ...Split Strategies	Read <i>Teaching Number</i> Ch. 8 and 9 Respond to Class 12 postings Activity Video #2
14	May 11	Early Multiplication and Division Understanding Multiplication and Division	Read <i>Teaching Number</i> Ch. 10 Read <i>How Children Learn</i> Ch. 6 & Appendix Respond to Class 13 postings Guided Math Class Plan and Reflection <b>OR</b> Mini Conference Presentation
15	May 18	Summarizing the big ideas	Respond to Class 14 postings All incomplete assignments due