**GEORGE MASON UNIVERSITY**
**COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT**
**DIVISION OF ELEMENTARY, LITERACY AND SECONDARY EDUCATION**

**EDPD502: Inquiry-Based Mathematics Instruction in Grades K-2**
**Spring/2014**
**Monday/4:30-7:30 PM**
**January 6 – May 12, 2014**
**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 is based on the principles of both Math Recovery and Assessing Math Concepts. It involves a comprehensive study of early numeracy and its application in an inquiry-based classroom. This course relies heavily on recent research in these areas and builds from diagnostic assessments developed by Wright, Stafford, and

Maryland and by Kathy Richardson. The assessments focuses 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 videotape their work with students on assessments and learn research-based methods for teaching mathematics for understanding. 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.

**COURSE FORMAT:**
Class meetings will be structures for maximum teacher participation. Each class will begin with discussion of mathematical topics and readings. The focus of the mathematical content will be based in the readings assigned. Mathematical problems, activities, and lessons supporting these concepts will be modeled, practices, 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 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. Teachers will videotape their work with students on assessments and learn research-based methods for teaching mathematics for understanding.

**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**

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).

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

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

Each class, 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.

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

Each participant, individually or with a partner, will be responsible for reading about and doing one activity/assessment from an upcoming chapter in the text. Results and reflections will be posted to a discussion forum. Other participants will respond to the posting prior to the next class. An in-class discussion of the activity and responses will follow.

**Reflections**

**Readings –** Participants will read and respond in writing and/or in an online discussion format to all reading assignments. Reading reflections will include relevance to the teacher's professional growth, possible changes in student behavior, and mathematical growth that might occur if ideas in the reading(s) are implemented. All points in reflections must be supported, informally, with references from the article.

**Mathematics Problems –** Participants will solve assigned mathematics problems with all thinking shown and participants should be prepared to discuss solutions in class.

**Online Activities –** Participants will complete and/or respond to all online activities, which are to be explored independently and noted as part of the reflections.

**Inquiry-Based Lesson Plan and Summary of Lesson** – Write a lesson plan for an inquiry-based lesson, teach the lesson, and write a reflection upon completion of the lesson.

Lesson plan will be written in one of a choice of formats provided. Lesson will be taught within a specified timeframe. Reflection should be an informal description of the actual lesson after it is taught. Particular emphasis should be placed on the teacher's professional pedagogical growth, including unexpected occurrences or outcomes, what would be done differently if the lesson were taught again, etc.

**Assessment Videos** – Videotape your administration of the *Math Recovery* or *Assessing Math Concepts* Assessment(s).

Videos and informal reflection/commentary will be shared with the class for discussion. Videos may be used to practice evaluating Math Intervention levels.

**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 LESSON PLAN ASSIGNMENT**
**MAT 220.1**

| Criteria | Meets Requirements (A, A-) | Needs Improvement (B+, B, C) |
|---|---|---|
| **Lesson Plan** | The lesson plan includes all/most criteria for a standards-based lesson: 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 lesson plan is not complete, does not include some or all criteria for a standards-based lesson. |
| **Complete Description of Instruction** | Description of lesson as taught includes details related to all aspects covered during the lesson, including tapping into prior knowledge, teacher's role in instruction, students' role(s) and responses in lesson, how students were assessed (formative &/or summative). | Description of lesson is not complete, lacks details related to some or all aspects of the lesson as taught. |
| **Timeframe** | Lesson was taught within the timeframe allotted, i.e. completed by Nov. 7 deadline. | Lesson was not taught prior to Nov. 7 deadline. |
| **Lesson Reflection** | Teacher reflection on actual lesson as taught includes discussion of teacher's pedagogical growth as a result of planning and teaching the lesson, description of unexpected outcomes or occurrences, what would be done differently if the lesson were taught again. | Lesson reflection is not complete, does not address some or all of the criteria required. |

Comments:

**GRADING SCALE:**
**A=93%-100%**
**A-=90%-92%**
**B+=87%-89%**
**B=83%-86%**
**B-=80%-82%**
**C=70%-79%**
**F=Below 70%**

**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 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 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 or call 703-993-2474 to access the DRC.

**PROPOSED CLASS SCHEDULE:**
**LAST DAY TO DROP CLASS WITHOUT ACADEMIC/FINANCIAL PENALTY IS BEFORE 20% OF THE CLASS SESSIONS HAVE MET (NLT January 27, 2014).**

| CLASS | DATE | TOPIC/LEARNING EXPERIENCES | READINGS/ASSIGNMENTS |
|---|---|---|---|
| 1 | Jan. 6 | The Teacher as a Learner | *Teaching Number* Ch. 11 |
| 2 | Jan. 13 | Building Number Sense in the Classroom | *How Children Learn* Intro & Ch. 1 |
| 3 | Jan. 27 | Approaching, Organizing, and Designing Instruction | *Teaching Number* Ch. 1 & 2 |
| 4 | Feb. 3 | Number Words and Numerals | *Teaching Number* Ch. 3<br>Respond to Ch 3 posting |
| 5 | Feb. 10 | Computation: Properties, Facts, and Algorithms | *How Children Learn* Ch. 2 & 3<br>Respond to Ch. 2&3 postings<br>Assessment A & B Materials |
| 6 | Feb. 24 | Addition and Subtraction: Word Problems and Solution Strategies | *How Children Learn* Ch. 4 & 5<br>Respond to Ch. 4&5 postings |
| 7 | Mar. 1 | BNVCTM Conference | Conference Reflection (due 3/10) |
| 8 | Mar. 10 | Early Counting and Addition | *Teaching Number* Ch. 4<br>Respond to Ch 4 postings |
| 9 | Mar. 17 | Structuring Numbers 1 to 10 | *Teaching Number* Ch. 5<br>Respond to Ch 5 postings |

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| 10 | Mar. 24 | Advanced Counting: Addition and Subtraction | *Teaching Number* Ch. 6<br><br>Respond to Ch 6 postings |
| 11 | Mar. 31 | Structuring Numbers 1 to 20 | *Teaching Number* Ch. 7<br><br>Respond to Ch 7 postings |
| 12 | Apr. 7 | 2-digit Addition and Subtraction: Jump Strategies | *Teaching Number* Ch. 8<br><br>Respond to Ch 8 posting |
| 13 | Apr. 28 | 2-digit Addition and Subtraction: Split Strategies | *Teaching Number* Ch. 9<br><br>Respond to Ch 9 posting |
| 14 | May 5 | Early Multiplication and Division<br>Review of Assessment Video | *Teaching Number* Ch. 10<br>*How Children Learn* Ch. 6<br><br>Respond to Ch. 10 & Ch. 6 postings<br><br>Assessment Videotape |
| 15 | May 12 | Review of Assessment Video | Assessment Videotape |