GEORGE MASON UNIVERSITY

EDUC 513 Teaching K-6 Mathematics
in International Schools

Instructor:

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Consultant Hours: By appointment

**Course Description**

This course is an introduction to methods for teaching all children, including those from non-mainstreamed populations, developmentally appropriate topics in Number and Operations, Algebra, Geometry, Measurement, and Data Analysis and Probability (the five NCTM Content Standards). This is a hands-on, activity, workshop-oriented experience. Students work with manipulatives and technologies to explore mathematics, solve problems, and learn ways to teach mathematics content to children. Field experience is required.

Purpose of the Course:
The purpose of this course is an inquiry into mathematics teaching and learning that will guide the student in ones teaching career and give the tools that will enable the student to continue to inquire and learn as a part of ones vocation as a teacher. In this course, the teaching of mathematics will be explored, investigating both what to teach (the content) and how to teach it (the pedagogy). What it means to do mathematics will be explored, as well as, what it means to understand mathematics through individual, small group, and large group mathematical problem solving. Investigated will be ways to represent understandings of mathematical concepts, ways to communicate reasoning about mathematical ideas and ways to construct mathematical arguments. In addition, in order to help children build connections and see relationships among mathematical ideas, students will investigate and read about ways children might represent mathematical concepts. Finally, by reading and discussing the importance of mathematical tasks, mathematical tools, the roles of teachers and students, and the assessment of mathematical understanding, the characteristics of a classroom environment conducive to mathematical learning will be explored.
Student Outcomes

This course is designed to enable students to:

1. Know what constitutes the essential topics in mathematics K-6 in International Schools.

2. Identify and use selected manipulatives and technology such as Linking Cubes, Attribute Blocks, Geoboards, Base-10 Blocks, Fraction Circles, Pattern Blocks, Tangrams, Calculators and Computers to teach appropriate mathematics content topics in the primary and elementary grades.

3. Identify and use various instructional strategies and techniques (cooperative, "Pair-share", and peer group learning, activity centers, laboratories and workshops, teacher directed presentations, etc.) to teach mathematical content topics appropriate for the primary and elementary grades to all children, including those from non-mainstreamed populations.

4. Identify and use alternative methods of assessing students' work in mathematics in the primary and elementary grades.

5. Solve problems in the content areas of Number and Operations, Algebra, Geometry, Measurement, and Data Analysis and Probability appropriate for adaptation for the primary and elementary grades.

6. Know and explain what is a "standards-based" mathematics curriculum, what are the key elements of the National Council of Teachers of Mathematics *Principles and Standards for School Mathematics*, and what are the key elements of the Virginia *Standards of Learning* for Mathematics.

<table>
<thead>
<tr>
<th>Course Student Outcomes (above)</th>
<th>NCTM Principles and Standards</th>
<th>ISTE NETS</th>
<th>INTASC</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>S1, S2, S3, S4, S5</td>
<td>SI</td>
<td>P1, P7</td>
</tr>
<tr>
<td>B</td>
<td>S10</td>
<td>SII</td>
<td>P1, P2, P6</td>
</tr>
<tr>
<td>C</td>
<td>P1, P2, P3, P4, P6</td>
<td>SII</td>
<td>P1, P2, P3, P4</td>
</tr>
<tr>
<td>D</td>
<td>P5</td>
<td>SIV</td>
<td>P3, P8</td>
</tr>
<tr>
<td>E</td>
<td>S1, S2, S3, S5, S6</td>
<td>SI</td>
<td>P4, P6</td>
</tr>
<tr>
<td>F</td>
<td>S1-10, P1-6</td>
<td>SI</td>
<td>P1, P7, P9</td>
</tr>
</tbody>
</table>

Key:
ISTE NETS = International Society for Technology in Education National Education Technology Standards 2000, where S = standard number
INTASC = Standards for Licensing Beginning Teachers, where P = principles
**Nature of Course Delivery**

The course is delivered through a variety of face-to-face, on-line and individualized instructional strategies. During class meetings there are large group, small group, and individual activities. Students also conduct independent research and field experience, as well as communicate with each other and the instructor via an email listserv.

**Required Text**  
Elementary School Mathematics- Teaching Developmentally  
Fifth Edition  
John A. Van de Walle  
Addison Wesley Longman, Inc.

**Optional Resource:**  
Curriculum and Evaluation Standards for School Mathematics  
April 2000  
National Council of Teachers of Mathematics  
Online: www.nctm.org

Allyn and Bacon

**Course Requirements and Assignments**

Assignments are intended to further your understanding of mathematics and what it means to teach and learn mathematics in light of current reforms in mathematics education.

Exam (20%)  
Field Experience (20%)  
Lesson Plans & Presentations (40%)  
Math Ed Websites (5%)  
Participation and Professionalism (15%)

A. **Exam (20%)**
   The exam will consist primarily of computation and problem-solving questions that focus on mathematics content and pedagogy throughout elementary grades.

B. **Field Experience (20%)**
   See field experience information.

C. **Lesson Plans & Presentations (40%)**
   - You are required to design three lesson plans; one lesson plan of your choice will be presented in class.
   - The format for designing your lesson plan is included in this handout.
Plan lessons with a problem solving approach. Focus on the integration of mathematical tools (manipulatives, calculators, computers) and representations (concrete, visual, symbolic) to provide children with an interactive, conceptually based mathematics experience.

D. Math Ed Websites 5%
   Prepare a short report on three websites.
   - What resources and services are available at this site?
   - How might YOU use this site?
   - Why would you recommend this site to other educators?

E. Participation (15%)
   - Attendance: It is your responsibility to attend all class sessions. You are accountable for all information each class session whether you are present or not.
   - Tardiness: It is your responsibility to be on time for each class session.

GSE Statements 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/catalogue/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.
I. Objectives
   • State what students will be able to do as a result of this experience.
   • List national, state or local objectives, if possible.

II. Materials for Learning Activities
   • List the texts, equipment, and other materials to be used by the students.
   • List the materials, including equipment or technology used by the teacher in presenting the experiences.

III. Procedures for Learning Activities
   • Introduction – outline procedures for activating the prior knowledge and student interest.
   • Instructional strategies – outline what the teachers and students will do.
   • Summary – outline how you will close.
   • Give estimated time for each phase of the experience (introduction, instruction, summary).
   • Describe extensions or connections to other lessons.

IV. Assessment
   • Outline the procedures and criteria that will be used to assess each of the stated objectives.
   • Attach copies of any written assessments (tests, rubrics, observational checklists, format for anecdotal records).
V. Differentiation
- List adaptation that will be made for special needs students (gifted, special education, other)

VI. Reflection
- After the lesson, reflect on what went well and what did not go well.
- Write changes you might implement the next time the lesson is taught.

**SCORING RUBRIC - LESSON PLAN**
Written Lesson Plan

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>DESCRIPTORS/GUIDELINES</th>
</tr>
</thead>
</table>
| **3** Excellent | • Lesson Plan is well written and clear  
• Lesson Plan competently addresses all aspects of the "model" lesson plan given to students  
• Lesson Plan indicates a thorough understanding of concepts  
• Lesson Plan provides evidence of a knowledgeable application of mathematics and indicates a solid understanding of mathematics content  
• Lesson Plan uses models in an appropriate and creative way  
• Lesson Plan goes beyond the requirements enumerated in the "model" lesson plan.                                                                 |
| **2** Satisfactory | • Lesson Plan is written clearly  
• Lesson Plan addresses most aspects of the "model" lesson plan  
• Lesson Plan indicates understanding of concepts  
• Lesson Plan shows evidence of the application of mathematics and indicates an understanding of mathematics content  
• Lesson Plan includes models  
• Lesson Plan satisfies all requirements                                                                                                                   |
| 1  | Needs Improvement | • Lesson Plan isn't written clearly and lacks continuity  
• Lesson Plan shows evidence of the lack of the understanding of the concepts  
• Lesson does not use appropriate strategies  
• Lesson Plan does not include models  
• Lesson Plan is incomplete or inadequate  
• Lesson Plan does not satisfy all requirements |
<table>
<thead>
<tr>
<th>LEVEL</th>
<th>DESCRIPTORS/GUIDELINES</th>
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</thead>
</table>
| 3 Excellent              | • Journal includes copious notes  
                               • Three or more written descriptions (write-ups) are provided using the "Field Experience Recording Sheet"  
                               Write-up includes in detail: the lesson, how the lesson was presented, integration with other subjects, the grouping, classroom management techniques and strategies, the diversity of the students, multicultural needs, what the teacher does to encourage cooperation between students, and the use of models  
                               • Instructors receive a detailed outline of observations along with written reports: name of school, teacher, grade-level, amount of time observed  
                               • Eight or more teachers are observed, or 8 or more different classes are observed  
                               • Write-up reflects thorough understanding of the principles and concepts studied in this course  
                               • Write-up includes an idea how the teacher's lesson may be improved  
                               • Comprehensive two page or more page synthesis of observations provided the class prior to the last class of the course |
| 2 Satisfactory           | • Journal with notes  
                               • Two written-descriptions are provided using "Field Experience Recording Sheet"  
                               Write-up includes most of the following: the lesson, how the lesson was presented, integration with other subjects, the grouping, classroom management techniques and strategies, the diversity of the students, multicultural needs, what the teacher does to encourage cooperation between students, and the use of models  
                               • General information about the location, etc. of each observation is provided  
                               • Five or more teachers are observed, or 5 or more different classes are observed  
                               • Write-up reflects understanding of some of the principles and concepts studied in this course  
                               • Two page synthesis of observations provided the class prior to the last class of the course |
| 1 Needs Improvement      | • Journal remarks are minimal  
                               • Less than two write-ups of lessons are provided  
                               • Write-ups of lessons have few details  
                               • Write-ups demonstrates lack of the understanding of the concepts  
                               • Information about the location, of each observation etc. is missing  
                               • Less than 20 hours of observation are completed  
                               • No synthesis provided |
FIELD EXPERIENCE INFORMATION

GUIDELINES:

1. Students will arrange to visit classes in a particular school, arrive on time, check in with the office, meet the appropriate teacher, record observations in their journal, ask the teacher to sign the journal or some record of observations.

2. Students will observe and take notes in a variety of mathematics classes at different levels, K-6.

3. Students will take notes on teachers’ lessons and instructional practices in journals. The Field Experience Recording Sheet should be used as a guide for the items to be observed during field experience and recorded in the journal.

4. Students may peruse curriculum guides, textbooks, instructional materials and other teaching materials if available.
School Visited:______________________

FIELD EXPERIENCE GUIDE FOR OBSERVATION
Date______ Hours:________
Teacher/Grade Level:______________________

Use the questions below for observation.

1. Briefly describe the lesson.

2. How would you classify the math lesson? Is it teacher-centered or student-centered? Was there a problem solving approach (a la Van De Walle)? Evidence?

3. Is the math lesson integrated with other subject areas? What other subjects are involved?

4. Identify the grouping. Is the lesson a small group or a total class lesson?

5. What are the classroom management techniques and strategies evident?

6. How is the teacher working with diverse populations? Do you observe multicultural needs?

7. Identify what the teacher does to encourage cooperation between students.

8. In the math lesson how are concepts taught through the use models? Are the students assisted in making connections between the models and concepts?
## Syllabus - 2004

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<th>Date</th>
<th>Topic</th>
<th>Homework Assignment</th>
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<tr>
<td></td>
<td></td>
<td><strong>Due Wednesday July 21st:</strong> Find the Principles and Standards on the NCTM Website (<a href="http://standards.nctm.org/document/index.htm">http://standards.nctm.org/document/index.htm</a>). Read pages 30 through 70. Read Chapter 5 in Van de Walle.</td>
</tr>
<tr>
<td>July 21</td>
<td>Introductions</td>
<td>Read chapters 6 and 7 in Van de Walle. Bring questions and comments on readings to class. Write a one to 2 page reflection about your reading of the NCTM standards. Begin working on lesson plans.</td>
</tr>
<tr>
<td>July 22</td>
<td>Chapter 6 - Developing Early Number Concepts and Number Sense</td>
<td>Read chapters 9 and 10 in Van de Walle. Work on Lesson Plans.</td>
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<tr>
<td>Date</td>
<td>Topic</td>
<td>Homework Assignments</td>
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<tr>
<td>July 23</td>
<td>Chapter 9 Whole-Number Place-Value Development</td>
<td>Read Chapter 12 and 13</td>
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<td></td>
<td>Chapter 10 Strategies for Whole Number computation</td>
<td>Work on Lesson Plans and web site reviews.</td>
</tr>
<tr>
<td></td>
<td>Instructor Presentation Chapter 11 Number Sense and Estimation with Whole Numbers</td>
<td>Review material for final exam.</td>
</tr>
<tr>
<td></td>
<td>Presentation of lesson plans on place value, number sense and computation</td>
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<td></td>
<td>Logic activities</td>
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<td>July 26</td>
<td>Chapter 12 Developing Fraction Concepts</td>
<td>Read Chapters 14 and 16</td>
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<tr>
<td></td>
<td>Fraction checklist activities</td>
<td>Work on Lesson Plans and web site reviews.</td>
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<td>Chapter 13 Computation with Fractions</td>
<td>Look over material for Final.</td>
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<tr>
<td></td>
<td>Presentation of fraction lesson plans</td>
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<td></td>
<td>Discussion about material on Final Exam</td>
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<td>July 27</td>
<td>Chapter 14 Decimal and Percent Concepts and Decimal Computation</td>
<td>Read Chapter 17</td>
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<tr>
<td></td>
<td>Instructor Presentation Chapter 15 Developing concepts of Ratio and Proportion</td>
<td>Work on Lesson Plans and web site reviews.</td>
</tr>
<tr>
<td></td>
<td>Presentation of decimal and percent lesson plans</td>
<td>Look over material for Final.</td>
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<tr>
<td></td>
<td>Technology Presentation by Ann Potter</td>
<td></td>
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<tr>
<td>Day</td>
<td>Chapter(s)</td>
<td>Additional Activities</td>
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<tr>
<td>July 28</td>
<td>Chapter 16 Developing Measurement Concepts</td>
<td>Read Chapter 18 Work on Lesson plans and web site reviews.</td>
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<tr>
<td></td>
<td>Chapter 17 Geometric Thinking and Geometric Concepts</td>
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<tr>
<td></td>
<td>Lesson Plan Presentations on geometry and measurement</td>
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<tr>
<td>July 29</td>
<td>Chapter 18 Exploring Concepts of Probability and Data Analysis</td>
<td>Work on Lesson Plans and web site reviews.</td>
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<td></td>
<td>Instructor Presentation</td>
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<td></td>
<td>Chapter 19 Algebraic Reasoning</td>
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<td>Lesson Plan Presentations</td>
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<td></td>
<td>Final Exam</td>
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<td>July 30</td>
<td>Closure activities</td>
<td>CELEBRATE!</td>
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<td>Catalogues</td>
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<td></td>
<td>Retake of final if necessary</td>
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<tr>
<td></td>
<td>Lesson plan presentations</td>
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<tr>
<td></td>
<td>All lesson plans and web site reviews due</td>
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</table>