George Mason University
EDCI 552: MATH METHODS FOR THE ELEMENTARY CLASSROOM (3)
Spring 2013

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Class Meets	
Office Hours	By appointment

Email this completed form in a Word doc. to me prior to the first day of class if you didn't get my earlier email request.

Name:
Email address:
Phone numbers: Cell/home
SCHOOL NAME:
GRADE:
Educational Background:
Interesting fact about you and your future plans:
Topics you'd like to explore/improve in teaching mathematics:

I. Course Description
This course introduces methods for teaching all children topics in arithmetic, geometry, algebra, probability, and statistics in elementary grades. It focuses on using manipulatives and technologies to explore mathematics and solve problems.
Prerequisite: Admission to the Elementary Education Licensure Program

II. Student Outcomes
This course will enable students to:

A. Know what constitute the essential topics in mathematics of the modern early and intermediate grades school program.
B. Identify and use selected manipulatives and technology such as linking cubes, attribute blocks,

geoboards, base-10 blocks, fraction circles, tangrams, calculators, and computers to teach appropriate mathematics content topics in the early and middle grades.

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

D. Identify and use alternative methods for assessing students' work in mathematics in the early and intermediate grades.

E. Solve problems in the mathematical content areas of logic, number theory, geometry, algebra, probability, and statistics appropriate for adaptation to the early and intermediate grades.

F. Know and explain a standards-based mathematics curriculum, the key elements of the National Council of Teachers of Mathematics Principles and Standards for School Mathematics, and the key elements of the Virginia Standards of Learning for Mathematics.

Additionally, this course supports the CEHD Core Values of collaboration, ethical leadership, research-based practice, social justice, and innovation. Statements of these goals are at http://cehd.gmu.edu/values/.

III. Relationship to Program Goals and Professional Organizations Student Outcomes Referenced to Selected National Standards

Course Student Outcomes (above)	NCTM Principles and Standards	ISTE NETS	ACEI
A	S1, S2, S3, S4, S5	SI	1.0
B	S10	SII	3.1
C	P1, P2, P3, P4, P6	SII	1.0, 2.3, 3.1, 3.3, 3.4
D	P5	SIV	4.0
E	S1, S2, S3, S5, S6	SI	2.3
F	S1-10, P1-6	SI	1.0

Key:
NCTM Principles and Standards = National Council of Teachers of Mathematics Principles and Standards for School Mathematics (2000), where P = principles and S = standards.
NETS = International Society for Technology in Education National Education Technology Standards 2000, where S = standard number
ACEI = Association for Childhood Education International Elementary Education Standards

IV. Nature of Course Delivery

In this course we will begin an inquiry into mathematics teaching and learning that will guide you in your first teaching job and give you the tools that will enable you to continue to inquire and learn as part of your work as a teacher. Class sessions will be interactive and will include a variety of hands-on experiences with concrete and virtual manipulatives appropriate for elementary school mathematics. We will explore the teaching of mathematics, investigating both *what* to teach and *how* to teach it. We will explore what it means to do mathematics and what it means to understand mathematics through individual, small group, and large group mathematical problem solving. We will investigate ways to represent understandings of mathematical concepts, communicate reasoning about mathematical ideas, and construct mathematical arguments. We will investigate and read about ways children might represent mathematical concepts, looking at ways to help children build connections and see relationships among mathematical ideas. We will explore characteristics of a classroom environment conducive to mathematical learning by reading and discussing the importance of mathematical tasks, mathematical tools, the roles of teachers and students, and the assessment of mathematical understanding.

V. Required Texts & Readings

Van De Walle, J., Karp, K. S., & Bay-Williams, J. M. (2011). *Elementary and Middle School Mathematics: Teaching Developmentally.* (8th edition) New York: Allyn & Bacon.

A student membership in NCTM is recommended but not required. $39 per year from http://www.nctm.org/membership/content.aspx?id=7618

VI. Course Requirements and Assignments

Attendance. It is your responsibility to attend all class sessions. You are held accountable for all information from each class session whether you are present or not. Please report your reasons for any absences to the instructor in writing. Tardiness. It is your responsibility to be on time for each class session. Please report your reasons for any tardiness to the instructor in writing.

Assignments. The assignments across the semester are intended to further your understandings of what it means to teach, learn, and assess mathematics in light of current reforms in mathematics education. All assignments are to be turned in to your instructor on time. **Late work will not be accepted for full credit.** If the student makes prior arrangements with the instructor, assignments turned in late will receive a 10% deduction from the grade per late day or any fraction thereof (including weekends and holidays).

Weekly Problem Sets & Reflective Responses (20%)
Individual Student Assessment (30%)
Lesson Plan Summary Reports (50%)

A. Problem sets, reflections and postings- 20 points per week x 5 weeks (20%)

Rich, meaningful, problem-based tasks will be assigned for each session. Students are expected to complete these problems before class and incorporate their thinking about strategies used to solve the problems in class discussion. Work on problem sets will be shared in class and on occasion may be collected and evaluated.

Problem Sets: Each class sessions will consist of working on problem sets and analyzing student work. Problem sets are to be completed before each class session. Students are expected to analyze and reflect solution strategies and come to class prepared to participate in the discussion.

Reflections postings Participants will write reflections on the problems encountered during the course. Participants will complete reflections and may choose the problems/tasks that interest them from those assigned during class. This writing should include three major parts: 1) a description of the problem and an example of the participants' thinking about that problem and multiple strategies; 2) a reflection on changes in the participant's own understanding and thinking with regard to that math concept/problem; and 3) related implications for teaching and learning in the K-8 setting.

B. Individual Student Assessment (30%) – 300 points- Performance Based Assessment for the Course

In order to plan effective instruction, you will need to know how to assess children's knowledge of mathematical concepts. One way to assess children's thinking is a diagnostic assessment. This assignment has two parts: (1) Design a plan for the assessment, assessing a specific mathematics topic using concrete, pictorial and abstract representations, (2) Conduct the assessment with a child and write a report describing the outcome of the assessment. Based upon feedback from the instructor on your plan, you may make modifications to the final plan and report. **(30% FINAL REPORT)**

C. Weekly Lesson Reflections/Summaries (50%) 100 points per lesson/week.

You are required to plan, teach, and complete 5 lessons based on the content presented each week in class. Integrate the use of mathematics tools (manipulatives, calculators, computers) and representations (concrete, pictorial, symbolic) to provide children with an interactive, conceptually-based mathematics experience. The lesson plan summaries are a three-phase process: (1) Design the

lesson plan based on a topic from class (game, full lesson, etc.) (2) Teach the lesson in your classroom, and (3) Report evidence of student learning from the lesson in a reflection following the rubric.

Total of 1000 points for your final grade.

Attendance. It is your responsibility to attend all class sessions. You are held accountable for all information from each class session whether you are present or not. Please report your reasons for any absences to the instructor in writing.
Tardiness. It is your responsibility to be on time for each class session. Please report your reasons for any tardiness to the instructor in writing.

	LEVEL	**OF**	**PERFORMANCE**	
ELEMENT	*Distinguished (9 – 10 points)*	*Proficient (8 points)*	*Basic (6 - 7 points)*	*Unsatisfactory (1 - 5 points)*
Attendance & Participation	The student attends all classes, is on time, is prepared and follows outlined procedures in case of absence. The student actively participates and supports the members of the learning group and the members of the class. Presentations demonstrate a deep knowledge of student error patterns as well as implications for teaching.	The student attends all classes, is on time, is prepared and follows outlined procedures in case of absence; the student makes active contributions to the learning group and class. Presentations demonstrate sufficient knowledge of student error patterns as well as implications for teaching.	The student is on time, prepared for class, and participates in group and class discussions. The student attends all classes and if an absence occurs, the procedure outlined in this section of the syllabus is followed. Presentations demonstrate minimal knowledge of student error patterns	The student is late for class. Absences are not documented by following the procedures outlined in this section of the syllabus. The student is not prepared for class and does not actively participate in discussions. Presentations are lacking knowledge of student error patterns and connections to teaching.

VII. Evaluation Schema

The mathematics education courses in GSE's Elementary Education Program integrate pedagogy and mathematics content appropriate for the elementary school grades. For students to earn a grade of A in the course, they must demonstrate excellence in *both* the pedagogical knowledge and the content knowledge of the mathematics appropriate at their level of teaching. Thus, the grading in the course is structured to help evaluate fairly student excellence in both areas. Problem sets and assessment work focuses primarily on ascertaining student excellence in handling mathematics content appropriate for the elementary grades, and represents 50% of students' grades. Pedagogical knowledge is ascertained primarily from readings, assignments and participation in the course, and represents 50% of students' grades. Therefore students who demonstrate excellence in both pedagogical knowledge and content knowledge receive grades of A.

VIII. Course Schedule

Course Schedule SPRING CLASS SCHEDULE 552- TRA

Date	Course Content	Read for next week…..	Due
January 23	Nuts and Bolts How Do Children Learn Mathematics? CRA Format and Number Worlds Whole Number Operations and Algorithms	Van de Walle: Ch. 1-4	Introduction
January 30	Assessment: MRI/PBA Conducting a Diagnostic Interview Number Sense, Counting, Patterns & Place Value	Van de Walle: Ch. 5, 8-9	Lesson 1 HW/Reflection
February 6	Problem Solving Strategies PBA Planning Non Fiction Reading Algorithm Analysis- Multiple Representations	Van de Walle: Ch. 3-4, 11-13	Lesson 2 HW/Reflection
February 13	Fraction Concepts and Computation Algorithm Analysis- Multiple Representations	Van de Walle: Ch. 9 and 15- 16	Lesson 3 HW/Reflection
February 20	Decimals and Percents Mystery Classes	Mystery Class Project	Lesson 4 HW/Reflection
February 27	Data Analysis Probability	Van de Walle: Ch. 21-22	Lesson 5 HW/Reflection
March 6	Communication: Promoting Math Talk Proportional Reasoning Algebraic Thinking	Van de Walle: Ch. 14 and 18	PBA

Lesson Review/Summary GRADING REQUIREMENTS

GENERAL REQUIREMENTS:

***** The lesson plans must be handed in on time. (If the lesson is not handed in on time, subtract 10% from the total score on the report **per late day**.)

* You must integrate manipulatives, literature, and/or technology into your lessons.

Paragraph	Contents of the Lesson Reflections	Points
1	**Math Concept:** What math concept, presented from class, are you teaching and what prior knowledge (readiness skills) do the students need to have coming into this lesson? Explain fully.	_____ (10)
2	**The Plan:** What is the instructional goal (what do you want the students to walk away understanding?) and based on what you have learned in class and in Vandewalle, what elements of constructivist learning are you looking for when you evaluate the lesson? **Do these two paragraphs BEFORE you start your lesson search.**	_____ (15)
3	**Preparing:** How did the lesson you chose fit your plan? Describe any modifications you had to make and why. How did you prepare for the lesson? What went through your head? How did you practice? Did you "do" the lesson or exercises yourself or did try it out on someone? What strategies did you use to make sure you did the lesson the way you planned? Include any prep sheets or Post It notes with the write up. (Basically I want to see the organizational strategy that fits you.)	_____ (15)
4	**Materials:** Where did you get the manipulatives and how difficult was it to find them? Where there any special items you had to prepare (put in group boxes, pre-cut, run sheets, etc) ? How did you organize the manipulatives so the kids could pick up, use and return them properly? How did you prepare the students for the proper use of the manipulatives? Did it work? How would you change this next time?	_____ (15)
5	**Reflect on the lesson:** What went well? What did you learn from this experience? What (if any) unexpected things changed what your original plan? How did you deal with them? Had you thought about contingency plans? If so, how did that help you when you had to switch gears? How did you break the lesson up by time and how did your estimates meet reality? What did you have to do to differentiate? Had you planned for differentiating? What student responses did the students give that you did NOT anticipate? How did you deal with it? How engaged were the students? How did you know if they learned what you wanted them to learn? How did you have them share their thinking? (Think, pair, share or what?) Give me an example of something that intrigued you about student thinking. Were they used to doing it? Was it easy or hard for them? • Identify one important idea you learned about teaching and learning mathematics by this process as well as one important teaching skill you plan to put more effort into the next time you teach a mathematics lesson. This can be anything from how you chose the lesson, prepared for the lesson, assessed student thinking and learning, or doing the lesson itself.	_____ (25)
6	**Work Samples:** Attach several samples (or pictures) of student work. Choose at least one that characterizes strength and understanding and at least one that characterizes weaknesses that need to be addressed. Right on their papers, using a red or colored pen, analyze the students' thinking. Tell me what you are seeing and why.	_____ (20)

Individualized Student Assessment Guidelines
(Performance Based Assessment for the Course)

PLAN

Student Assessment PLAN

The Child:
Describe the child you plan to assess. Include information you gathered about the child (grade level, age, gender, race, and academic ability level). What do you know about the child's level of understanding about the topic *before* the assessment?

The Mathematics Concept:
Select one specific mathematics concept to assess during the assessment. Examples of concepts might include patterns, sorting, addition of whole numbers, division of fractions, finding averages, percent, geometric shapes, or length measurement. Tell why this concept is appropriate for this child at this particular grade level.

Different Forms of Representation:
During the assessment, assess the child using three different forms of representation. Identify the three different forms of representation you will use during the assessment with at least one example in each form. *Concrete* representations include manipulatives, measuring tools, or other objects the child can manipulate during the assessment. *Pictorial* representations include drawings, diagrams, charts, or graphs that are drawn by the child or are provided for the child to read and interpret. *Symbolic* representations include numbers or letters the child writes or interprets to demonstrate understanding of a task.

Tasks & Questions:
Design tasks and questions that use three different forms of representation (concrete, pictorial, abstract symbols) to diagnose the child's understanding of ONE basic concept. Go beyond the basic level of determining the child's factual knowledge of the concept by asking questions that determine how much the child understands about the concept. For example, suppose you are assessing the concept of ADDITION. (1) Create several tasks where the child uses concrete manipulatives to demonstrate her understanding of addition; ask questions about the child's understanding of the addition tasks with manipulatives. (2) Create several tasks where the child is asked to create or interpret drawings to demonstrate her understanding of addition; ask questions about the child's understanding of these tasks with pictorial models; (3) Create several tasks where the child uses abstract symbols (and letters) to demonstrate her understanding of addition; ask questions about the child's understanding of these addition tasks using the symbols.

The plan should be typed.

Individual Student Assessment Guidelines
(Performance Based Assessment for the Course)
REPORT

Student Work Samples:
Collect and document three different forms of representation (concrete, pictorial, abstract symbols) during the assessment to elicit the child's level of understanding. The report must include samples of the child's computations, writings and drawings, as well as a description of how the child used concrete objects during the assessment or photographs of the child's work.

Question & Response Assessment Excerpts:
Type key excerpts from the assessment. Type only those questions and responses that pertain to mathematics. Be sure to include your questions and the child's responses. Indicate what you said and what the child said by using T for you (the teacher) and C for the child.

Questioning Competence:
The questions and follow-up questions that you use during the assessment will be evaluated. You will be evaluated on the *quality* and the *types* of follow-up questions you use during your interaction with the child. Your textbooks and readings provide direction on the types of questions that are appropriate in an assessment and that go beyond factual information to deeper understanding.

Evaluation of Child's Mathematical Knowledge:
Write an evaluation of the child's mathematical knowledge in the content area. Use evidence from the assessment to support your conclusions. Use your textbook to help you describe the specific types of behaviors and verbalizations you observed using specific mathematical terms. For example, if you conclude that the student has an understanding of addition of fractions with like denominators, you should base this on evidence that you present that shows the child was able to represent $\frac{3}{5}$ and $\frac{4}{5}$ with fraction pieces (concrete), and/or the child used a drawing to find the sum (pictorial), and/or the child computed the answer with symbols (abstract). Give specific examples of the child's responses to support your statements.

Instructional Plan:
Develop a suggested instructional plan for the child. Your assessment of the child's thinking should give you some information for planning instruction. Your suggestions should be based on what you learned about the child during the assessment. Many general suggestions can be valuable for children. However, your recommendations should relate to specifics. For example, if you assessed basic division concepts and you suggest that the instructional plan for the child should include more manipulatives, that would be an important teaching strategy, but it would be too general. You should be more specific about why and how manipulatives might be used. Example: "The student had difficulty making 3 equal groups from a set of 21 chips; therefore, the student should be given more experiences with grouping and partitioning manipulatives in sets of 15 to 30 to develop both the measurement and partitive concepts of division."

Reflection of the Assessment Process:
Comment on the assessment process. How long did the assessment last? What did you learn about assessment techniques? What did you learn about your ability to create mathematics questions and tasks for this concept? If you were to conduct the assessment with another child, would there be any changes in your questions, either the order or the level of difficulty, or the materials you had available for the child to use? Why or why not? What have you learned about how children learn mathematics from this assessment? How might a classroom teacher use the diagnostic mathematics assessment to assess children?

The report should be typed.

RUBRIC FOR ASSESSMENT REPORT

Criteria	Exceeds Requirements (A)	Meets Requirements (A-,B+,B)	Needs Improvement (C)	Inc.	Weight
Is the required information present about the child assessed?	5 In addition to the required information, the Report includes information about the child's performance in other academic, social, or behavioral areas. Cite references.	4 3 2 The Report includes the child's grade level, age, gender, race, academic ability level, and the child's level of understanding about the mathematics concept.	1 One or more of the required descriptive items about the child is missing.	0	x .05 =
Has the teacher selected one specific mathematics concept and assessed the concept using three different forms of representation (concrete, pictorial, abstract)?	5 Information on age-appropriate variations of the mathematics concept was gathered in preparation for the assessment. One math concept is clearly described and mathematically accurate. Three different forms of representation, with different examples in each form, are designed for use in interesting and creative ways. Connections are made among representational forms. Cite references.	4 3 2 One age-appropriate mathematics concept is selected, mathematically accurate, and clearly described. Three different forms of representation are described and used appropriately to assess the mathematics concept. Different examples may be used within each representational form.	1 One or more mathematics concepts are selected. They may not be age-appropriate. The Report is missing one or more forms of representation.	0	x .10 =
Do the tasks and questions match the specific mathematics concept being assessed? Is there variety in the tasks and questions used for each of the three different forms of representation?	5 In addition to the tasks/questions being aligned with the math concept, there are questions that differentiate and provide extensions for different levels of student performance. In addition to the variety of tasks/questions for each of the three forms of representation, tasks that show creativity and will be motivating for a child are included. Cite references.	4 3 2 The tasks and questions designed for the assessment are aligned with the mathematics concept being assessed. There are a variety of tasks and questions for each of the three forms of representation.	1 The tasks and questions designed for the assessment are not clearly aligned with the mathematics concept being assessed. The Report is missing tasks/questions that address one or more of the forms of representation.	0	x .15 =
Are the child's work samples included with three different forms of representation present in the work samples?	5 In addition to the variety of work samples from the child showing examples in each of the three forms of representation, a creative way of providing an explanatory overview of the child's work is included.	4 3 2 There are a variety of work samples from the child included showing examples in each of the three forms of representation. (concrete, pictorial, abstract)	1 There is only one work sample in each of the three forms of representation or work samples from one form of representation are missing.	0	x .10 =
Is the required question and response assessment excerpts present?	5 The Report includes key excerpts from the mathematics assessment that includes descriptive information on both the behaviors and the actual verbalizations that occurred during the assessment.	4 3 2 The Report includes excerpts of the mathematics assessment using the teacher and the child's actual verbalizations from the assessment (T for teacher; C for child).	1 The Report includes excerpts of the mathematics assessment, but some parts of the assessment conversation are limited.	0	x .15 =
Do the initial and follow-up questions used by the teacher demonstrate variety and higher levels of questioning? Are specific follow-up questions used appropriately?	5 The transcript shows that during the assessment, the teacher used a variety of questions to encourage the child to express his/her thinking, used many higher-level questions to encourage deeper thinking and responses from the child, and used specific follow-up questions to probe for understanding.	4 3 2 The transcript shows that during the assessment, the teacher used a variety of higher-level questions to encourage deeper thinking and appropriate follow-up questions to probe for understanding.	1 The transcript shows that during the assessment, the teacher used very few probing and follow-up questions when a specific follow-up question would have been appropriate.	0	x .10 =
Does the evaluation accurately represent the child's current level of understanding on this concept using supporting evidence and work samples from the assessment?	5 The evaluation provides an accurate and detailed description of the child's current level of understanding on the concept. Many different and specific examples from the assessment are given, including the child's quotations, student work, and information from other sources on math development, to provide supporting evidence for the evaluation of the child.	4 3 2 The evaluation provides an accurate description of the child's current level of understanding on the mathematics concept. Different examples from the assessment are given, including the child's quotations and student work, to provide supporting evidence for the evaluation.	1 The evaluation provides a minimal description of the child's understanding on the mathematics concept. A few examples from the assessment are given, but there is not enough information to provide supporting evidence for the evaluation.	0	x .15 =
Does the instructional plan prescribe developmentally appropriate next steps for instruction and take into account the child's current level of understanding on this concept?	5 The plan is a creative, detailed description of developmentally appropriate next steps for instruction taking into account the child's current level of understanding. The plan identifies many specific examples of activities and tasks that would further enhance this child's knowledge of this concept. Information from other sources on math development and child development was used. Cite references.	4 3 2 The instructional plan describes developmentally appropriate next steps for instruction. The plan identifies several specific examples of tasks that would be appropriate to further enhance this child's knowledge on this concept. The plan describes these tasks in relation to the child's current level of understanding.	1 The plan describes some next steps for instruction that may not be developmentally appropriate. The plan gives general (rather than specific) examples of activities and tasks for the child. The tasks may not be appropriate either for the child or the development of the math.	0	x .10 =
Is there an appropriate reflection and evaluation of the assessment process?	5 In addition to the required information, the Report includes a detailed analysis, self-reflection, and self-evaluation of the assessment process.	4 3 2 The Report includes a reflection and evaluation on the assessment process including the required elements.	1 The Report does not include one or more of the required elements for the reflection.	0	x .10 =
TOTAL SCORE					

A	**5.0 – 4.5**
A-	**4.49 – 3.5**
B+	**3.49 – 2.5**
B	**2.49 – 2.0**
C	**1.99 – 1.0**
Unsatisfactory	**0.99 or below**

TASKSTREAM REQUIREMENTS

Every student registered for any Elementary Education course with a required performance-based assessment (will be designated as such in the syllabus) is required to submit this assessment ("Individual Student Assessment") to TaskStream (regardless of whether a course is an elective, a onetime course or part of an undergraduate minor). Evaluation of your performance-based assessment will also be provided using TaskStream. Failure to submit the assessment to TaskStream will result in a the course instructor reporting the course grade as Incomplete(IN). Unless this grade is changed upon completion of the required TaskStream submission, the IN will convert to an F nine weeks into the following semester.

GMU POLICIES AND RESOURCES FOR STUDENTS

a. Students must adhere to the guidelines of the George Mason University Honor Code [See http://oai.gmu.edu/honor-code/].
b. Students must follow the university policy for Responsible Use of Computing [See http://universitypolicy.gmu.edu/1301gen.html].
c. Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students solely through their Mason email account.
d. The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance [See http://caps.gmu.edu/].
e. Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform teir instructor, in writing, at the beginning of the semester [See http://ods.gmu.edu/].
f. Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
g. The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing [See http://writingcenter.gmu.edu/].

PROFESSIONAL DISPOSITIONS

Students are expected to exhibit professional behaviors and dispositions at all times.

CORE VALUES COMMITMENT

The College of Education & Human Development is committed to collaboration, ethical leadership, innovation, research-based practice, and social justice. Students are expected to adhere to these principles. http://cehd.gmu.edu/values/

For additional information on the College of Education and Human Development, Graduate School of Education, please visit our website [See http://gse.gmu.edu/].