

George Mason University
EDCI 552: MATH METHODS FOR THE ELEMENTARY CLASSROOM (3)
EDCI 547: TECHNOLOGY in the MATH CLASSROOM (1)
*15 hours of field work in math in the classroom**
Summer 2013

<i>Instructor</i>	Dr. Molly Rothermel Rawding
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<i>Office Hours</i>	By appointment

Jul 01, 2013 - Aug 02, 2013

Week 1: July 1-5: Independent assignments & readings

Week 2: July 8-12: Meet Thompson Hall L019 ~ 9:30-11:45am

Week 3: July 15-19: Meet Thompson Hall L019 ~ 9:30-11:45am

Week 4: July 22-26: Meet at Westlawn Elementary School in Falls Church ~ 9am-12noon

Week 5: Jul 29-Aug2: Meet at Westlawn Elementary School in Falls Church ~ 9am-12noon

***Field component hours are woven into course work hours during the last two weeks of course.**

Co-facilitators

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Along with the above facilitators, trained clinical faculty will also support students in this class.

Required Text

Van De Walle, J., Karp, K. S., & Bay-Williams, J. M. (2012). *Elementary and Middle School Mathematics: Teaching Developmentally*. (8th edition) New York: Allyn & Bacon.

I. Course Description

An introduction to methods for teaching all children including those from non-mainstreamed populations developmentally appropriate topics in arithmetic, geometry, algebra, probability and statistics. 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.

Prerequisite: Admission to the Elementary Education Licensure Program

II. Student Outcomes

This course will enable students to:

- A. Know what constitutes 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 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.

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	INTASC
A	S1, S2, S3, S4, S5	SI	P1, P7
B	S10	SII	P1, P2, P6
C	P1, P2, P3, P4, P6	SII	P1, P2, P3, P4
D	P5	SIV	P3, P8
E	S1, S2, S3, S5, S6	SI	P4, P6
F	S1-10, P1-6	SI	P1, P7, P9

Key:

NCTM Principles and Standards = National Council of Teachers of Mathematics Principles and Standards for School Mathematics (2000), where P = principles and S = standards.

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

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. Attendance and engaged participation is essential.

V. Required Texts & Readings

VI. Course Requirements and Assignments

Guidelines for Achievement

1. Be on time.
2. Come ready and prepared to learn.
3. Respect your rights & the rights of others to learn.
4. Work at learning.
5. Ask for support.

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 ASSIGNMENTS: 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). Type all papers in 12 point Times New Roman using one-inch margins.

Assignment	Possible points
Mathematics Content/Pedagogy Response #1 (due July 1)	30
Mathematics Content/Pedagogy Response #2 (due July 2)	30
Mathematics Content/Pedagogy Response #3 (due July 3)	30
Mathematics Content/Pedagogy Response #4 (due by July 25)	30
Mathematics Content/Pedagogy Response #5 (due by July 28)	30
Mathematics Content/Pedagogy Response #6 (due by July 31)	30
Let's Do Math (due by July 1)	30
Let's Do Math (due by July 3)	30
Individual Student Assessment – Plan	60
Individual Student Assessment – Report	120
Center Activity	90
M ² / M ³ Lesson Plan	180
In-Class Learning Experiences	360

A. Mathematics Content/Pedagogy Responses ~ Math Journals, Memos and Reflections

These short responses that focus on mathematics content in the elementary grades, with some questions focusing on methodological content. Responses should be posted on Blackboard unless otherwise noted. For each assignment, respond to at least one other student in the class with either a comment or a question.

These journal entries should be an *in-depth* reflection. In particular,

1. Provide a brief summary of what you learned/covered that day in the class/camp (you can refer to a rich problem, reference your readings; student work).
2. Reflect upon the connections within mathematics and/or between mathematics and other disciplines.(Math Knowledge Connections)
3. Reflect upon how your work today could impact your work as an elementary school teacher. In particular, discuss how you plan to incorporate some aspect of what you learned today into a lesson you teach. (Math Knowledge for Teaching)

Writing these memos will provide you with the opportunity to think mathematics, about your work for the day and how you might use what you learned in your practice as an elementary school teacher. The journals will be graded on completeness and on the quality of the reflection. There is no right or wrong answer for any of the pieces of the journal.

Rubric

0 points	Response is not completed yet
10 point	Response is has been written; the requirements for length and depth need to be reviewed and revised.
20 points	Response is completed (all requirements met). Ideas could be developed and extended.
30 points	Response is completed (all requirements met) and ideas are well-developed. Respond to at least one other student's memo.

B. Individual Student Assessment – 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.

C. Lesson Plans & Center Presentations

You are required to plan, teach, and complete a formal summary for two mathematics research lessons during your field placement (summer camp). The first lesson (center activity) may be taught in a small group setting, while the other lesson (M³ lesson) will be for the entire class. Integrate the use of mathematics tools (manipulatives, calculators, and 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, (2) Teach the lesson in your classroom, and (3) Collect and report evidence of student learning from the lesson in a reflection.

D. In-Class Learning Experiences

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.

A variety of presentation and participation activities will be integrated into our class sessions. You will share ideas on a meaningful lessons/technology/resource (brief presentations) during class sessions. You will participate in class activities such as measurement centers during class time. These assignments require your active engagement in class sessions; therefore, it is essential that you are an engaged participant.

ELEMENT	LEVEL OF PERFORMANCE			
	<i>Distinguished</i>	<i>Proficient</i>	<i>Basic</i>	<i>Unsatisfactory</i>
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 need more evidence of knowledge of student error patterns and connections to teaching.	The student needs to arrive on time more often. Absences need to be addressed. The student needs to be more prepared for class. Presentations need more evidence of knowledge of student error patterns and connections to teaching.

- Collaborate with your team on the lesson.
- Turn lesson plan in on time.
- Integrate manipulatives, literature, and/or technology into your lessons.
- Provide opportunities for students to have meaningful math experiences

The clinical teacher may give you feedback on your lesson. Ask your clinical teacher if you would like specific feedback on your lesson.

THE LESSON

Objectives

- The objectives clearly state what students will do during the lesson.
- The objectives clearly state the mathematics content/essential understandings of the lesson.
- The objectives are tied to state/national standards.
- The objectives are tied to the assessment; this information is provided in the assessment section of the report.

Materials

- A list of materials used during the lesson is provided.
- A copy of the materials is included with the lesson.
- A variety of materials are used in each lesson (manipulatives, technology, etc.).
- The lesson integrates the use of mathematics tools (manipulatives, calculators, computers) and/or representations (concrete, pictorial, symbolic).
- The teacher creates materials for the lesson.
- Appropriate materials are selected for the concepts being taught.
- The lessons do not overuse worksheets.

Procedure

- The lesson is substantive in length, breadth, and depth.
- Any questions and mathematics content the teacher uses during the lesson are included in the procedures.
- The procedures thoroughly and completely outline what the teacher will do during the lesson; How did you present the lesson?
- The procedures are in a bulleted list, approximately 1-2 pages in length.
- The procedures provide enough detail to allow another person to teach the lesson.***

ENGAGE	The procedures include an introduction for activating prior knowledge.
EXPLORE (Hands on, Minds on)	The procedures show that students are engaged in <u>doing</u> mathematics during the lesson.
EXPLAIN	The procedures thoroughly and completely outline what the students will do during the lesson. Estimated times for each phase are provided in parentheses. Students explain their understanding of concepts and processes. New concepts and skills are introduced as conceptual clarity and cohesion are sought
ELABORATE	Activities allow students to apply concepts in contexts, and build on or extend understanding and skill. The procedures include a plan for closing the lesson and checking for understanding.
EVALUATE	Students assess their knowledge, skills and abilities. Activities permit evaluation of student development and lesson effectiveness. Connecting to other concepts

Differentiation

Gearing up and gearing down

A list of adaptations for individual students is included.

Specific information must be provided on individual students in the class and the accommodations made for those children.

(General comments are not appropriate for this requirement.)

Assessment / Work Samples

The assessment used during the lesson is described in approximately ½ -1 pages.

The description of the assessment is clear enough that another person could conduct the assessment; What was the assignment?

The assessment describes what the teacher does to assess the students.

The assessment describes in detail what the students do to demonstrate their understanding of the concept.

An example of the assessment conducted during the lesson is attached to provide documentation of what students did during the lesson (i.e., written work, drawings, worksheets, photographs, checklists, anecdotal records).

The objectives are tied to the assessment; this information is provided in the assessment section of the report.

Reflection

The reflection is 1-2 pages in length.

A portion of the reflection describes the mathematics teaching and learning that occurred during the lesson and how it related to the lesson plan prepared ahead of time.

A portion of the reflection discusses those elements of the lesson that went well and those that you would do differently for more success.

A portion of the reflection discusses at least three changes or improvements that you would make to the lesson if you were teaching it again.

A portion of the reflection identifies one important idea you learned about teaching and learning mathematics from the lesson. (Ideas that focus on behavior management strategies are not acceptable for this requirement.)

A portion of the reflection identifies one important teaching skill you plan to work on the next time you teach a mathematics lesson.

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

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.

Schedule for Week 1: July 1-5: Independent Assignments & Readings

Dates	Topic/Learning Experiences	Readings & Assignments
Monday, July 1	<p>How do we address NCTM content and process standards as students learn mathematics?</p> <p>What does it mean to know and do mathematics?</p>	<p><i>Setting the stage for Best Practices</i> Read Van de Walle: Chapters 1-2</p> <p>Journal Prompt 1 on Bb: What does it mean to do mathematics? How do your experiences in math shape how you think about teaching mathematics?</p> <p>Reply to at least one classmate on Bb.</p> <p><i>Let's Do Math #1</i> – problem/activity will be sent via email or posted on Bb</p> <p>Explore: http://nctm.org</p>
Tuesday, July 2	<p>How do students learn mathematics through problem solving?</p> <p>How might we plan in the problem-based classroom?</p>	<p><i>Setting the stage for Best Practices</i> Read Van de Walle: Chapters 3-4</p> <p>Complete 3 math problems in Chapter 3</p> <p>Journal Prompt 2 on Bb: Identify the problems you chose. What was challenging? What was easy? Could you solve the problem in a different way? What might be the benefits of doing mathematics before your students do the math problem?</p> <p>Then reply to at least one classmate on Bb.</p>
Wednesday, July 3rd	<p>How do we assess students on their mathematical understanding?</p> <p>How do we support all learners?</p>	<p><i>Setting the stage for Best Practices</i> Read Van de Walle: Chapters 5-6</p> <p>Watch a lesson from the Teaching library on http://learner.org</p> <p>Journal Prompt 3 on Bb: What video did you watch? What are your top three “take-aways” from the video?</p> <p>Then reply to at least one classmate on Bb.</p> <p><i>Let's Do Math #2</i> – problem/activity will be sent via email or posted on Bb</p>
Thursday, July 4	<p>Holiday</p>	
Friday, July 5	<p>What are some benefits of technology in the mathematics classroom?</p> <p>What experiences develop early number sense?</p>	<p><i>Setting the stage for Best Practices</i> Read Van de Walle: Chapters 7-8</p> <p>Go to http://illuminations.nctm.org Explore the applets for early number sense and evaluate the technology.</p> <p>Technology prompt #1 Pick two of your favorites to evaluate. What did you like about the applet? How does it connect to the reading? What questions do you have?</p> <p>Then reply to at least one classmate on Bb.</p>

Schedule for Week 2&3: July 8-19: Assignments & Readings

Dates	Topic/Learning Experiences	Readings & Assignments due for class
Monday, July 8	Planning for Instruction Number Sense, Counting, Patterns & Place Value/Basic Facts & Whole Number Operations	Van de Walle: Chapter 9 Developing Meaning for the Operations Chapter 10 Helping Children Master the Basic Facts
Tuesday, July 9	Promoting Math Talk/Discourse Continue exploring: Number Sense, Counting, Patterns & Place Value/Basic Facts & Whole Number Operations	Van de Walle: Chapter 11 Developing Whole-Number Place-Value Concepts Chapter 12 Developing Strategies for Whole-Number Computation
Wednesday, July 10	Decimals, Ratios, & Percent Data Analysis, Statistics, & Probability Assessment – Conducting a Diagnostic Interview	Van de Walle: Chapter 13 Using Computational Estimation with Whole Numbers
Thursday, July 11	Multiple Representations ~ Algebraic Thinking: Generalizations, Patterns, and Functions	Van de Walle: Chapters 14 Algebraic Thinking
Friday, July 12	TEACHING MATHEMATICS WITH TECHNOLOGY Extra learning opportunity: Create supplemental activities to go along with the lesson.	Review chapter 7 in Van de Walle Technology Prompt #2: Reflection on Chapter 7- <i>Writing to Learn #1</i> Technology Prompt #3: Complete student exploration and review lesson from www.Explorelarning.com . <i>(sign up for a 30-day trial account)</i>
Monday, July 15	Understanding of Fractions Conceptually	Van de Walle: Chapter 15 Developing Fractions Concepts
Tuesday, July 16	Operations with Fractions	Van de Walle: Chapter 16 Developing Strategies for Fraction Computation
Wednesday, July 17	Proportional Thinking	Van de Walle: Chapter 17 Developing Concepts of Decimals and Percents Chapter 18 Proportional Reasoning

<p>Thursday, July 18</p>	<p>Measurement & Geometry</p>	<p>Van de Walle: Chapter 19 Measurement concepts Chapter 20 Geometry</p>
<p>Friday, July 19</p>	<p>TEACHING MATHEMATICS WITH TECHNOLOGY <i>with a focus on Data, Statistics, & Probability</i></p>	<p>Van de Walle: Chapter 21 Developing Concepts of Data Analysis Chapter 22 Exploring Concepts of Probability Technology Review #4: Review the “Online Resources” at the end of chapter 21 and 22. Select two resources that you like and think would be useful to use in the classroom. Why do you like the resource? What can it do? How can students “discover” math using it?</p>

Schedule for Week 4&5: July 22-Aug2: Assignments & Summer PDS Lesson Rounds

Dates	Topics/Learning Experiences	Readings & Assignments due for class
Monday, July 22 nd	Focus on assessing students – pre-assessment analysis Targeted Observation – Upper and Primary	Reading the curriculum packet & high leverage practices (assigned articles from TCM or MTMS – posted on Bb)
Tuesday, July 23 rd	Targeted Observation – Upper and Primary	Reading the curriculum packet
Wednesday, July 24 th	Targeted Observation – Upper and Primary	Reading the curriculum packet
Thursday, July 25 th	Targeted observation: assessment and differentiation in math lessons	Reading the curriculum packet
Friday, July 26 th	Center activities planned by interns	Reading the curriculum packet Individual Student Plan Due
Monday, July 29 th	Teaching and Assessing Learning Lessons in primary and upper	Reading the curriculum packet Technology Review #5: (Due by July 29)
Tuesday, July 30 th	Teaching and Assessing Learning Lessons in primary and upper	Reading the curriculum packet
Wednesday, July 31 st	Assessing learning through student written work Prepare for Math Fair	Individual Student Assessment Final Report Due
Thursday, August 1 st	Family Math Fair	Reading the curriculum packet
Friday, August 2 nd	Moving Forward to Teach Students Mathematics	Final Reflection

TaskStream Requirement:

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

MASON'S COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT

Student Expectations

- Students must adhere to the guidelines of the George Mason University Honor Code [See <http://oai.gmu.edu/honor-code/>].
- Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See <http://ods.gmu.edu/>].
- Students must follow the university policy for Responsible Use of Computing [See <http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/>].
- 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.
- Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.*
- Students are expected to exhibit professional behaviors and dispositions at all times.

Campus Resources

- 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/>].
- 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/>].
- For additional information on the College of Education and Human Development, Graduate School of Education, please visit our website [See <http://gse.gmu.edu/>].
- *The university has a policy that requests students to turn off pagers and cell phones before class begins; however, you may leave your cell phone on vibrate to receive emergency calls in class. If your phone is set to vibrate, then please keep your phone easily accessible, immediately accept the call so it does not continue to vibrate, say "please hold," and walk outside the room before beginning your conversation. Laptops and PDAs may be used in class during group and individual work time to maintain emergency contact and assist with you with your work, but laptops must be kept closed and PDAs face-down during whole class discussions. Register for campus alerts at <https://alert.gmu.edu>. An emergency poster exists in each classroom explaining what to do in the event of crises. Further information about emergency procedures exists on <http://www.gmu.edu/service/cert>.
- The College of Education and Human Development strives to represent a set of core values that drive the work of faculty and students. These values of collaboration, ethical leadership, innovation, research-based practice, and social justice are further described on the CEHD website <http://cehd.gmu.edu/values/>.