

GEORGE MASON UNIVERSITY  
COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT

EDPD502.6R2: Learning and Doing Mathematics in Grades 6-8

Fall 2016

Kelly Leadership Center  
Prince William County Schools

Co-Instructor: *Kathleen Judge*

Phone: 703.791.8849

Email: [judgekm@pwcs.edu](mailto:judgekm@pwcs.edu)

Address: PO Box 389, Manassas, VA 20108

Co-Instructor: *Nakasha Kirkland*

Phone: 703.791.8849

Email: [kirkkans@pwcs.edu](mailto:kirkkans@pwcs.edu)

Address: PO Box 389, Manassas, VA 20108

### **Course Description**

Inquiry-based Mathematics Instruction is based on the principles of teaching mathematics through investigation and discovery. During this class, teachers will learn research-based methods for teaching mathematics for understanding. The primary focus for 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 are offered opportunities to struggle with complex, rich, and expandable mathematical tasks. Collections of tasks are chosen to help participants develop a deep understanding of some of the fundamental ideas in mathematics and build confidence in mathematical problem solving. During the course, teachers are engaged in inquiry-based mathematics investigations in both group and individual settings. A variety of manipulatives (color tiles, pattern blocks, interlocking cubes, Cuisenaire rods, Base Ten blocks, computer, document camera) are available to establish patterns and aid teachers' understanding. The instruction in the course is designed to further teachers' conceptual understanding, procedural fluency, and strategic competence in mathematics while modeling the pedagogy proven to be effective at leading to mathematical understanding in students.

### **Course Purpose and Intended Audience**

Results of national and international tests in mathematics achievement point to the need of reform in mathematics education for middle school students. This course is designed to increase teachers' knowledge of middle grades mathematics and the hierarchy of sophistication of children's strategies in place value of real numbers, operations with fractions, integers, and decimals, and other related topics.

### **Course Format**

Class sessions are structured for maximum teacher participation. Each class focuses on a discussion of current mathematical ideas and assigned readings. The focus of the mathematical content will be based on the readings assigned. Mathematical problems, activities, and lessons supporting these concepts are modeled, practiced, and discussed.

### **Course Objectives**

### Teachers will

- Focus their attention on strategies students use to solve problems.
- Shift their focus from teacher activities to student learning.
- Increase their own content knowledge of the mathematics they teach at the middle school level.
- Learn strategies to **teach, remediate, and enrich** the concepts of
  - number sense within the Real Number System,
  - operations with fractions, decimals, and integers,
  - ratios, percents, and proportional reasoning,
  - probability and statistics,
  - geometry and measurement, and
  - Algebra.

### Required Texts and Supplemental Readings

Required Texts:                *Math Matters*, by Suzanne H. Chapman and Art Johnson  
   *Accessible Mathematics*, by Steven Leinwand

#### Supplemental Readings:

Selected articles may be presented pertaining to middle school math topics and instruction from a variety of sources, including *Teaching Children Mathematics*, *Journal for Research in Mathematics Education*, *Educational Leadership*, and *Mathematics in the Middle School*.

### Class Requirements, Performance-Based Assessments, Evaluation Criteria, and Grading Scale

1. **Attendance and Class Participation:** Attend and participate in all class sessions. Repeated absences will be reflected in the course grade. Complete all readings as assigned and participate in all discussions and activities related to those readings.     (5 points per class)
  - a. **Expectation:** We have much to offer and learn from one another; therefore, active and respectful participation of all class members is crucial to the success of this course. Class discussion and activities cannot be reproduced. Participants in this class must be in attendance and on time for the entire class session in order to actively contribute to the enhancement of each session.
  - b. Note: failure to attend more than 20% of the classes will result in failure (F) in the course.
  - c. Attendance mandatory for the BNVCTM Fall Conference on Saturday, November 7, 2015.
2. **Written Reflections:** Read, reflect, and respond to all reading assignments from *Math Matters* (10 points each), *Accessible Mathematics* (7 points each), and other writings as assigned (7 points each).
  - a. **Expectation:** 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 readings are implemented. All points in reflections must be supported by references from the chapter.
    - Activities in *Math Matters* are to be explored independently and noted as part of the reflection. See attached rubric for *Math Matters*.

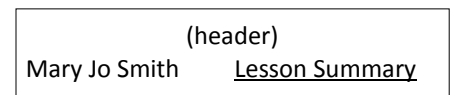
- Reflections on *Accessible Mathematics* assignments and other professional articles will be assessed according to the attached rubric.
- b. Written Reflections will be submitted **electronically** EACH WEEK
  - i. To **both** instructors through Outlook email
    - Subject line- **Last name - assignment**
  - ii. No later than the following Tuesday by **noon**
  - iii. Format **Guidelines**:
    1. Header includes name and assigned reading
    2. 600-750 words
    3. Font type – Calibri or Times New Roman



3. **Inquiry-Based Lesson Project:** Choose a topic/concept, write an inquiry-based lesson to teach the topic/concept, write a summary reflection upon completion of teaching the lesson, and gather student work samples to support lesson reflection. (125 points)

a. **Components:**

- **Lesson plan** is written using the Inquiry- Based Lesson Plan template provided.
  - Draft version of lesson plan- submitted by Week 7 (40 points)
  - Final version of lesson plan- submitted with presentation (45 points)
- **Lesson Summary** is an informal description of the actual lesson after it was taught. Particular emphasis is placed on the teacher’s professional pedagogical growth (as in, what was surprising or what would need to be done differently if this lesson would be taught again). Lesson Summary also includes references to student work. See attached rubric. (20 points)
  - Lesson Summary Format **Guidelines:** (see example below)
    1. Header includes name and **Lesson Summary**
    2. 600-750 words
    3. Font type – Calibri or Times New Roman
- **Presentation:** Each teacher presents their lesson plan (including student work samples) and Lesson Summary to classmates. (20 points)



4. **Math Happenings:** Collaborate with at least one other classmate to present a recent math article or math resource for 10 minutes of class time. (10 points)
- a. **Expectation:** Each teacher signs up for a class date with at least one other classmate. Together, the teachers collaborate on a topic or theme. The 10-minute presentation could include a book or an article read, a new website discovered that would be good for the group to explore, an idea for an activity for a specific topic in the curriculum, a classroom activity you have observed or have used in your classroom, or anything related to math or math instruction!!!
- b. Each teacher should equally share the talking time in front of the group.
- c. Handouts are optional.

5. **Performance Assessments:** Incorporate two (2) performance assessment tasks into instruction for at least one class of students. (Total 40 points: 20 points each)

- a. **Expectation:** Teachers review several academic tasks that would be appropriate for either formative assessment or summative assessment. Then choose two (2) tasks to incorporate into instruction for at least one class of students. For Task #1, choose from the

Performance Assessments found in the PWCS Unit Guide for Unit 1 for your grade level. For Task #2, choose a task from any source.

- b. Submit a **Summary Reflection**: Task #1 due Sept. 27; Task #2 due Dec. 6. See attached rubric. Summary Reflection includes:
- **Statistics Summary**: Narrative includes:
    - i. Specific statistics such as, total number of students, percent pass, and/or class average, and the like
    - ii. Item analysis
    - iii. References to student work
    - iv. Student concerns and why
    - v. Next steps, such as, more instruction, reteach, remediation, retest, and the like
  - **Personal Reflection**: Narrative includes:
    - i. What was your goal for using this task: formative or summative?
    - ii. Did the task have the desired outcome?
    - iii. How did you “grade” the task?
    - iv. How about the time factor?
    - v. What did YOU learn from this task?
    - vi. Other comments / reflections.
  - Summary Reflection format **Guidelines**: (see example below)
    1. Header includes name and **Performance Assessment Summary**
    2. 400 words
    3. Font type – Calibri or Times New Roman
    4. Line spacing: Normal (1.5)

	(header)
Mary Jo Smith	<u>Perf. Assmt. Summary</u>

### **Formula for Grading**

Percentages are based on the **total points possible** throughout the course.

A – 90% - 100%      B – 80% - 89%      C – 70% - 79%      F – BELOW 70%

NOTE: Assignments will be accepted up to one week late without penalty. Late assignments should be sent to **both** instructors through Outlook email. For assignments turned in more than a week late, assessment will begin with a 10% penalty.

### **GMU COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT STATEMENT OF EXPECTATIONS:**

The Graduate School of Education (GSE) expects that all students abide by the following: Students are expected to exhibit professional behavior and dispositions. See [gse.gmu.edu](http://gse.gmu.edu) for a listing of these dispositions.

Students must follow the guidelines of the University Honor Code. See [http://www.gmu.edu/catalog/apolicies/#TOC\\_H12](http://www.gmu.edu/catalog/apolicies/#TOC_H12) for the full Honor Code.

Students must agree to abide by the university policy for Responsible Use of Computing. See <http://mail.gmu.edu> and click Responsible Use of Computing at the bottom of the screen. Students with disabilities who seek accommodations in a course must be registered with the GMU Disability Resource Center (DRC) and inform the instructor, in writing, at the beginning of the semester. See [www.gmu.edu/student/drc](http://www.gmu.edu/student/drc) or call 703-993-2474 to access the DRC.


**PRINCE WILLIAM COUNTY SCHOOL MATH DEPARTMENT STATEMENT OF RESPONSIBILITY:**

Teachers taking graduate level classes paid for by the PWCS Math Department will be expected to attend all classes and to complete all assignments. Anyone dropping a class after it has started, failing a class, or not attending after registering in the online catalog will not be permitted to take any other class paid for by the Mathematics Office. Dropping a class from the online catalog must occur at least 48 hours prior to the start of the first class or this penalty will be in effect.

If, for some extraordinary reason, it is necessary to drop the class after it has begun, GMU withdrawal procedures must be followed. Failure to drop with GMU within their guidelines will result in an F for the class.

## SYLLABUS: Inquiry-Based Mathematics Instruction in Grades 6-8

CLASS	DATE (Tue.)	TOPIC	ASSIGNMENT for NEXT CLASS
1	9-6  Room 1101	Course Introduction and Syllabus GMU Registration and <i>Patriot Web</i> Begin <b><i>Accessible Math</i></b> Data and “Cena” Performance Assessments for Unit 1 (Gr. 6,7,8)	Read: <b>Acc Math</b> , Ch. 2 – 6 (pp.6-38) Write: personal reflection on reading “Poverty” article–Reflection due Nov.29 Unit 1 Performance Assessment Summary Reflection due Sept. 27
2	9-13  Room 1101	Math Happenings <b>Acc Math</b> , Ch. 2 – 6 ( <i>Shifts 1-5</i> ) The 5 E’s and Inquiry-Based Teaching Lesson Plan Project (with template and sample lessons) Task Time: Candy Dilemma Variable Dilemma	Read: <b>Acc Math</b> , Ch. 7-11 (pp. 39-71) Write: personal reflection on reading Lesson Plan Project- <b>Draft</b> lesson due 10-18
3	9-20  Room 1101	Math Happenings Discuss <b>Acc Math</b> , Ch. 7-11 (Shifts 6-10) Into. To <u>Math Matters</u> Sorting Activities Lesson Plan Project: Q&A	Read: <b>Acc Math</b> , Ch. 13 & Appendices (pp. 72-113) Write: personal reflection on reading Unit 1 Performance Assessment Summary Reflection due Sept. 27
4	9-27  Room 2002-04	Math Happenings Debrief Unit 1 Performance Assessment / Summary Reflection Discuss <b>Acc Math</b> , Ch. 13 & Appendices Integers: Number sense and computation	Read: <u>MM</u> Number Sense: Ch. 5 Fractions Sec.1 & 2: 99-121; Ch. 6 Decimals Sec.1 & 2: 133-143; Ch. 7 Percents Sec.1: 149-156. Write: personal reflection on reading
5	10-4  Room 1101	Math Happenings Number Sense: fractions, decimals, percents Task Time	Read: <u>MM</u> Computation: Ch. 5 Fractions Sec.3: 121-131; Ch. 6 Decimals Sec.3: 143-148. Write: personal reflection on reading
6	10-11  Room 1101	Math Happenings Computation for fractions and decimals Computation for integers Task Time	Read: <u>MM</u> , Ch.7 Percents Sec.2: 157-163; Ch.8 Ratios: 165-189. Write: personal reflection on reading Lesson Plan Project- <b>Draft</b> lesson due 10-18
7	10-18 Room 2011	Math Happenings Percents and Ratios Task Time	Read: <u>MM</u> , Ch. 9 Algebra: 191-219. Write: personal reflection on reading  Reminder: Performance Assessment #2 Summary Reflection due Dec. 6

CLASS	DATE (Tue.)	TOPIC	ASSIGNMENT for NEXT CLASS
8	10-25 Room 1101	Math Happenings Algebra Task Time	Read: <u>M M</u> , Ch. 10 Geometry: 220-247. (section 6 is optional) Write: personal reflection on reading
9	11-1 Room 1101	Math Happenings Geometry Task Time	Read: <u>M M</u> , Ch. 11 Spatial Sense: 248-270. Write: personal reflection on reading
<b>10 and 11</b>	<b>Sat., 11-5</b>	<b>BNVCTM Fall Conference (Attendance Mandatory)</b>	Write: personal reflection on your 3 breakout sessions; Due NLT 11-15
X	11-8	<b>Election Day</b> <b>***** NO SCHOOL- NO CLASS *****</b>	
12	<b>11-14 (Monday)</b> Room 1101	Math Happenings Lesson Presentations – first half Spatial Sense Task Time	Read: <u>M M</u> , Ch. 12 Measurement: 271-293. Write: personal reflection on reading Reminder: Performance Assessment #2 Summary Reflection due Dec. 6.
13	<b>11-21 (Monday)</b> Room 1101	Math Happenings Lesson Presentations – second half Measurement Task Time	Read: <u>M M</u> , Ch. 13 Statistics: 294-321. Write: personal reflection on reading DUE 11-29: Reflection on “Poverty” article, assigned on 9-6-15
14	11-29 Room 1101	Math Happenings Statistics Task Time	Read: <u>M M</u> , Ch. 14 Probability: <b>322-339</b> . * No reflection due for this reading Write: 2-page reflection on this class Reminder: Performance Assessment #2 Summary Reflection due Dec. 6.
15	12-6 Room 1101	Math Happenings Debrief Performance Assessment #2 Probability GMU Course Evaluations	
	12-13 Room 2011	Make-up day, if needed	

## Grading Rubric for Reflections on Math Matters reading assignments

	<b>No Evidence 0</b>	<b>Beginning 1</b>	<b>Developing 2</b>	<b>Accomplished 3</b>
<b>Criteria:</b> Reflection on <b>professional growth</b> .	No evidence of reflective thought about effect on <b>professional growth</b> .	Slight evidence of reflective thought about effect on <b>professional growth</b> .	Evidence of reflective thought about effect on <b>professional growth</b> .	Evidence of deep reflective thought about effect on <b>professional growth</b> .
<b>Criteria:</b> Reflection on possible <b>student mathematical growth</b> if ideas expressed in reading are implemented.	No evidence of reflective thought about effect on <b>student mathematical growth</b> .	Slight evidence of reflective thought about effect on <b>student mathematical growth</b> .	Evidence of reflective thought about effect on <b>student mathematical growth</b> .	Evidence of deep reflective thought about effect on <b>student mathematical growth</b> .
<b>Criteria:</b> Knowledge of content and mathematical reasoning in working through the <b>math activities</b> within the assigned reading.	No references to any of the <b>math activities</b> within the assigned reading.	References to few of the <b>math activities</b> within the assigned reading.	References to some of the <b>math activities</b> within the assigned reading.	References to most/many of the <b>math activities</b> within the assigned reading.
	<b>Not Satisfactory 0</b>			<b>Satisfactory 1</b>
<b>Criteria:</b> Writing is coherent and follows guidelines outlined in syllabus.	Written work is not coherent <b>or</b> does not follow guidelines outlined in syllabus.			Written work is coherent and follows guidelines outlined in syllabus.

**COMMENTS:**

**SCORE: \_\_\_\_\_ / 10**



## Grading Rubric for Reflections on Accessible Mathematics assignments and Professional articles assignments

	<b>No Evidence 0</b>	<b>Beginning 1</b>	<b>Developing 2</b>	<b>Accomplished 3</b>
<b>Criteria:</b> Reflection on <b>professional growth</b> .	No evidence of reflective thought about effect on <b>professional growth</b> .	Slight evidence of reflective thought about effect on <b>professional growth</b> .	Evidence of reflective thought about effect on <b>professional growth</b> .	Evidence of deep reflective thought about effect on <b>professional growth</b> .
<b>Criteria:</b> Reflection on possible <b>student mathematical growth</b> if ideas expressed in reading are implemented.	No evidence of reflective thought about effect on <b>student mathematical growth</b> .	Slight evidence of reflective thought about effect on <b>student mathematical growth</b> .	Evidence of reflective thought about effect on <b>student mathematical growth</b> .	Evidence of deep reflective thought about effect on <b>student mathematical growth</b> .
	<b>Not Satisfactory 0</b>			<b>Satisfactory 1</b>
<b>Criteria:</b> Writing is coherent and follows guidelines outlined in syllabus.	Written work is not coherent <b>or</b> does not follow guidelines outlined in syllabus.			Written work is coherent and follows guidelines outlined in syllabus.

**COMMENTS:**

**SCORE: \_\_\_\_\_ / 7**



## Grading Rubric for Inquiry-Based Lesson Project, Part 1

	<b>No Evidence 0</b>	<b>Beginning 1 (1 point each)</b>	<b>Developing 2 (3 points each)</b>	<b>Accomplished 3 (5 points each)</b>
<b>Criteria: Inquiry- Based Lesson Plan</b>	Inquiry-based lesson plan is not complete and language of the 5E Model is not evident.	Inquiry-based lesson plan is somewhat complete and language of the 5E Model is somewhat evident.	Inquiry-based lesson plan is mostly complete and language of the 5E Model is mostly evident.	Inquiry-based lesson plan is complete and language of the 5E Model is evident.
<b>– Draft</b>				
<b>– Final</b>	Writing is not coherent and/or does not follow guidelines outlined in syllabus.	Writing is not coherent and/or does not follow guidelines outlined in syllabus.	Writing is coherent and follows guidelines outlined in syllabus.	Writing is coherent and follows guidelines outlined in syllabus.
<b>Lesson Objective</b>				
<b>Explore</b>				
<b>Evaluate</b>				
<b>Engage</b>				
<b>Extend/ Elaborate</b>				
<b>Explain</b>				
<b>Resources</b>				
<b>Homework</b>				
<b>Post-lesson Reflection (not on Draft)</b>				

**COMMENTS: SCORE- Draft version: \_\_\_\_\_ /40**

**SCORE- Final version: \_\_\_\_\_ /45**

## Grading Rubric for Inquiry-Based Lesson Project, Part 2

	<b>No Evidence 0</b>	<b>Beginning 1 (10 points)</b>	<b>Developing 2 (15 points)</b>	<b>Accomplished 3 (20 points)</b>
<b>Criteria: Lesson Summary (written)</b>	<p>No evidence of reflective thought about lesson delivery and student understanding.</p> <p>Writing is not coherent and/or does not follow guidelines outlined in syllabus.</p>	<p>Slight evidence of reflective thought about lesson delivery and student understanding.</p> <p>Writing is not coherent and/or does not follow guidelines outlined in syllabus.</p>	<p>Evidence of reflective thought about lesson delivery and student understanding.</p> <p>Writing is coherent and follows guidelines outlined in syllabus.</p>	<p>Evidence of deep reflective thought about lesson delivery and student understanding.</p> <p>Writing is coherent and follows guidelines outlined in syllabus.</p>
<b>Criteria: Presentation</b>	<p>Oral presentation is missing explanation of lesson plan or lesson summary. Student work samples are not available as evidence.</p>	<p>Oral presentation is missing explanation of lesson plan or lesson summary. Student work samples are shown as evidence.</p>	<p>Oral presentation includes explanation of lesson plan and lesson summary. Student work samples are not available as evidence.</p>	<p>Oral presentation includes explanation of lesson plan and lesson summary. Student work samples are shown as evidence.</p>

**COMMENTS:**

**SCORE: \_\_\_\_\_ /40**

## Grading Rubric for Summary Reflection of Performance Assessment

	<b>No Evidence 0</b>	<b>Beginning 1 (5 points)</b>	<b>Developing 2 (7 points)</b>	<b>Accomplished 3 (10 points)</b>
<b>Criteria: Statistics Summary</b>	<p>Statistics Summary is not complete and does not meet the Criteria.</p> <p>Writing is not coherent and/or does not follow guidelines outlined in syllabus.</p>	<p>Statistics Summary is somewhat complete and parts of the Criteria are evident.</p> <p>Writing is not coherent and/or does not follow guidelines outlined in syllabus.</p>	<p>Statistics Summary is mostly complete and most of the Criteria are evident.</p> <p>Writing is coherent and follows guidelines outlined in syllabus.</p>	<p>Statistics Summary is complete and all of the Criteria are evident.</p> <p>Writing is coherent and follows guidelines outlined in syllabus.</p>
<b>Criteria: Personal reflection</b>	<p>Personal Reflection is not complete and does not meet the Criteria.</p> <p>Writing is not coherent and/or does not follow guidelines outlined in syllabus.</p>	<p>Personal Reflection is somewhat complete and parts of the Criteria are evident.</p> <p>Writing is not coherent and/or does not follow guidelines outlined in syllabus.</p>	<p>Personal Reflection is mostly complete and most of the Criteria are evident.</p> <p>Writing is coherent and follows guidelines outlined in syllabus.</p>	<p>Personal Reflection is complete and all of the Criteria are evident.</p> <p>Writing is coherent and follows guidelines outlined in syllabus.</p>

**COMMENTS:**

**SCORE: \_\_\_\_\_ /20**