

Non Degree course  
George Mason University  
GMU COMPLETE MATH  
Center for Outreach in Math Professional Learning and Educational  
Technology  
COS & CEHD  
**MATH 600: Transforming Instructional Practices: Proportional Reasoning**  
Summer-Fall 2016: Professional Development Outreach Course

**Course Organizers and Instructors:**

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**I. Course Description:**

**Proportional Reasoning**

This course focuses on developing proportional reasoning across the learning progressions in grades 5-9 through mathematical inquiry.

**Meeting dates:**

On campus: Monday - Friday, July 25 - 29 8:30am - 3:30pm

Saturday, September 17 9:00am - 2:00pm

Saturday, October 15 9:00am - 2:00pm

Saturday, November 19 Symposium 9:00am - 2:00pm

Lesson Study: Host lessons completed between October 17 and November 4; Reteach lessons completed between November 7 and November 11.

**II. Student Outcomes**

At the conclusion of this course, students should be able to:

1. Promote a better understanding of the nature of mathematics, learning progressions and mathematical inquiry
2. Demonstrate problem-solving strategies in proportional reasoning and methods for cultivating problems solving, reasoning and communicating skills
3. Foster an understanding of how children's mathematical thinking develops
4. Articulate methodologies for teaching mathematics more effectively to children with various abilities in Grades 5-9
5. Plan effective mathematics instruction for students from diverse populations with a variety of learning needs.

### **III. Nature of Course Delivery**

The delivery of this course combines methods of seminar, online sessions, active learning, discussion, independent work, student presentation, mathematical problem solving, and writing. The course is designed both in structure and process to engage students in dialogue at the individual, group, and collective levels. Different formats will be used to help build the capacity of the learning community. Readings and lectures will precede and focus class on-line discussions and interactive forums. This course relies on your willingness to participate in all class and team discussions. You will be asked to complete daily reading assignments and offer key ideas on how the readings inform professional experience. The syllabus lays out an initial plan for our work and may be revised during the course to meet students' needs and interests. Students are expected to be independent thinkers, intellectually curious, and responsible to each other for the quality of classroom learning. This calls for both purposeful collaborative work as well as deep individual reflection. The course is designed to enhance both of these skill sets. You should expect to spend time between classes reading/viewing/listening to assigned materials, completing assignments, completing reflections, solving problems, and participating in substantive online discussions.

### **IV. Readings:**

Lamon, S.J. (2015). *Teaching fractions and ratios for understanding (3rd ed)*. Mahwah, NJ: Lawrence Erlbaum.

Driscoll, M., Nikula, J., & Neumeyer, D. (2016). *Mathematical Thinking and Communication*

*Access for English Learners*. Heinemann.

### **V. Course Requirements and Assignments**

The assignments across the course are intended to improve your strategies as a mathematics teacher and to develop your skills in fostering proportional reasoning and instructional practices.

All assignments are to be completed on time so that class members might benefit from the expertise and contributions of their colleagues.

### **A. Participation, Problems and Reflections (30%)**

**Class Participation:** Class sessions will consist of a discussion of the readings and related problems. Readings are to be completed before each class session. Students are expected to analyze and reflect on the readings and come to class prepared to participate in the discussion.

**Problems and Reflections (10%)** Problems will be assigned for each class. Students are expected to complete these problems before class and incorporate their thinking about strategies used to solve the problems in class discussion. Assignments will be uploaded to the course Blackboard and paper copies of work should be brought to class for discussion.

**Reflections:** Participants will complete reflections on the problems encountered during the course within the context of equitable teaching practices.

This writing should include three major parts:

- 1) description of the problem and an example of the participants' thinking about that problem and strategy;
- 2) reflection on changes in the participant's own understanding and thinking with regard to that problem and equitable teaching practices; and
- 3) related implications for teaching and learning in the 5-9 setting.

**Online Modules (20%):** The four asynchronous online sessions are designed so that it can support your team work through the Individual and group Lesson study. We have provided due dates so that you can pace your work through the fall semester. August 30, September 30, October 30, November 15

Details for the online modules will be further explained on the online module site and will support with Assignment B and C

Module 1: (Due August 30) Selecting a Task & Do the Math!

Module 2: (Due -Sept. 19-30) Upload and annotate individual lesson in Edthena and analyze student work & Do the Math!

Module 3: (Due 10/31) Collect student tasks that show evidence of student learning & Do the math!

Module 4: (Due Nov 15) Individualized (2nd iteration) lesson study lesson plan and Edthena reteach (5 mins of video)

### **B. Individual Lesson and Reflection, and Edthena video reflection (30%)**

Participants will incorporate one of the NCTM *Principles to Actions* eight Effective Mathematics Teaching Practices into a rational numbers or proportional reasoning lesson in their own classroom. Teachers will submit a brief lesson description and reflection to Blackboard. In addition, teachers will upload a short video clip on Edthena showing evidence of at least one of the eight practices and then mark and comment on the video to reflect on the practices. Module 1 & 2 will support you in completing this assignment. (Due September 30th)

### **C. Collaborative Lesson Study Plan, Reflection and Edthena video reflection discussion (30%)**

During the course, participants will work with their lesson study team to create and implement a proportional reasoning task focusing on 2-3 of the eight practices with special attention on equitable access for all. Lesson team members will jointly create a lesson plan for the task, using the provided template and following Smith and Stein's *5 Practices for Orchestrating Productive Mathematics Discussion*. Using a modified lesson study protocol a member of the team will serve as the host teacher and teach the lesson. After a collaborative redesign, each other member will reteach the lesson with identified modifications. Every lesson study participant will complete a reflection on their lesson implementation, providing evidence of student thinking and accessibility, and post a short video clip to Edthena with reflection. The members of the lesson study group will conduct an online discussion around the video clips and lessons to synthesize their observations which will be presented at the end of course Symposium. Module 3 & 4 will support you in completing this assignment. (Due November 15)

### **D. Pre and Posttest and Final Reflection (10%)**

Students will take an online pretest and posttest covering proportional content in order to assess growth in mathematical knowledge for teaching. Points will be assigned for participation in both the pre and posttest and for a final course reflection. Students will be expected to demonstrate their own understanding of the content as well as the knowledge and understanding needed by grade 5-9 students in order to make sense of this content.

## **HOW LESSON STUDY GROUP WILL WORK**

### *Collaborative Planning Activity*

The choice of the proportional reasoning/rational numbers "Big Idea" and creation of lesson plans for the Collaborative assignment will begin on Friday during the summer session and be completed during the Saturday sessions in September and October. The Lesson Study Group will create/find a new task in their selected big idea and complete planning documents which will be provided. Lesson Study Team members are

required to participate in all discussions including face-to-face, synchronous online, and asynchronous online.

### *Lesson Implementation*

Teams will select a date between October 17 and November 4 to teach the hosted lesson. The follow-up, revised lessons will be taught by November 11. Each Lesson Study member (including the host teacher) will make a video of their lesson and then select approximately 5 minutes to share with their group via the Edthena platform reflecting evidence of the eight practices selected for focus by the group. After all lessons have been taught and all videos have been uploaded, the Study Group Team will meet online to discuss the lessons and videos on Edthena. The groups synthesized observations will be presented to the class at the symposium on November 19.

### *Written Lesson Reflection*

After the lesson implementation, each member of the Study Group will complete a reflection on the lesson, how it went, what modifications would be made for future teaching of the lesson, etc. in response to provided reflection questions.

### VI. Evaluation Schema

#### Determination of the Final Grade:

##### Graduate Grading Scale

A 93%-100%	B+ 87%-89%	C 70%-79%
A- 90%-92%	B 80%-86%	F Below 70%

### VII. UNIVERSITY POLICIES

The university has a policy that requests students to turn off pagers and cell phones before class begins.

### **HONOR CODE**

To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of George Mason University and with the desire for greater academic and personal achievement, George Mason University has set forth a code of honor that includes policies on cheating and attempted cheating, plagiarism, lying and stealing. Detailed information on these policies is available in the GMU Student Handbook, the University Catalog, and on the GMU website ([www.gmu.edu](http://www.gmu.edu)).

### **INDIVIDUALS WITH DISABILITIES POLICY**

The university is committed to complying with the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 by providing reasonable accommodations for applicants for admission, students, applicants for employment, employees, and visitors who are disabled. Applicants for admission and students requiring specific accommodations for a disability should contact the Disability Resource Center at 703-993-2474, or the University Equity Office at 703-993-8730.

### **ATTENDANCE POLICY**

Students are expected to attend the class periods of the courses for which they register. Although absence alone is not a reason for lowering a grade, students are not relieved of the obligation to fulfill course assignments, including those that can only be fulfilled in class. Students who fail to participate (because of absences) in a course in which participation is a factor in evaluation, or students who miss an exam without an excuse, may be penalized according to the weighted value of the missed work as stated in the course syllabus (GMU University Catalog, pg. 32).

## **GMU Policies and Resources for Students**

### *Policies*

- Students must adhere to the guidelines of the Mason Honor Code (see <http://oai.gmu.edu/the-mason-honor-code/>).
- 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 Mason 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 with disabilities who seek accommodations in a course must be registered with George Mason University Disability Services. Approved accommodations will begin at the time the written letter from Disability Services is received by the instructor (see <http://ods.gmu.edu/>).
- Students must follow the university policy stating that all sound emitting devices shall be silenced during class unless otherwise authorized by the instructor.

## *Campus Resources*

- Support for submission of assignments to Tk20 should be directed to [tk20help@gmu.edu](mailto:tk20help@gmu.edu) or <https://cehd.gmu.edu/api/tk20>. Questions or concerns regarding use of Blackboard should be directed to <http://coursessupport.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/>).
- 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 Office of Student Support staff helps students negotiate life situations by connecting them with appropriate campus and off-campus resources. Students in need of these services may contact the office by phone (703-993-5376). Concerned students, faculty and staff may also make a referral to express concern for the safety or well-being of a Mason student or the community by going to <http://studentsupport.gmu.edu/>, and the OSS staff will follow up with the student.

**For additional information on the College of Education and Human Development, please visit our website <https://cehd.gmu.edu/>.**

### Course Schedule:

Days and themes	Homework (written HW is from Lamon)
Monday, 7/25 <i>Absolute &amp; Relative</i>	Read MTC Ch 2 Skim Lamon Ch 1-3 Read pp1-3,9,13-14 (Ch 1) -Do pp 14-15 #1,2,5 Read pp 20,23, 31-35 (Ch 2) -Do pp36-38 #3,4,21 Read pp. 39-46 (Ch 3) -Do pp 55-57 #2,3,8,9 PtA Survey Monkey
Tuesday, 7/26 <i>Unitizing/ Part-Whole</i>	Read MTC Ch 3 Lightly read Lamon Ch 5 & 7 -Do: p.122 #2 (Ch 5) pp161-164 #2, 3, 4, 8 (Ch 7) Register on Edthena
Wednesday, 7/27 <i>Scalar/ Ratio Table</i>	Read MTC Ch 4 Skim Lamon Ch 4 Read pp. 64-68, 70-71, 81-83 -Do pp 86-88 #6,8,10,11,12 Edthena practice activity
Thursday, 7/28 <i>Modeling and Reasoning about Division of Fractions</i>	Read pp. 73-75; Do p.86 #4,7 Read pp. 99-100,105; Do p. 124-128 #10,11,20,21 Read pp. 133-135; Do p. 143 #4 Read pp. 156-160; Do p. 167 #20 Read pp. 200-201; Do p. 206 #12
Friday, 7/29 <i>Density/Measurement</i>	Work on individual and group task designs
Complete by Tuesday, August 30, 2016	Online Module 1 - Selecting a task
Saturday, September 17, 2016	Guest Speaker: Jill Depiper Group Lesson Study Planning
Complete by Friday, September 30, 2016	Online Module 2 - Individual task reflection
Saturday, October 15, 2016	Analyzing the collection of student work
Complete by Sunday, October 30, 2016	Online Module 3 - Student thinking analysis
October 17 - November 4, 2016	Lesson Study Season - complete initial teaching of Lesson Study task
Complete by Tuesday, November 15, 2016	Online Module 4 - 2nd iterations of group task
Saturday, November 19, 2016	Lesson Study Symposium