

Content Refresher & Pedagogy Enhancement for Teachers: Middle School Mathematics

COURSE SYLLABUS: MTE 500—3 graduate credits

Prerequisites Knowledge of Middle School Mathematics content and an undergraduate degree.

General Description The primary goal of this class is for the student to begin to acquire the techniques necessary to effectively teach Middle School Mathematics. This course will focus on the investigation of materials, pedagogy, and technology to teach Middle School Mathematics and to refresh content knowledge in ways that conform to the National Council of Teachers of Mathematics (NCTM) standards. Students will examine strategies and skills to creatively engage middle school level mathematics students as they begin to master.

Objectives This course is intended to provide appropriate training for the Middle School Mathematics teacher by providing opportunities to

- understand the core concepts of each content area through exploration of problems as they relate to teaching and learning strategies for the specific topics;
- develop an understanding of the role of investigative experiences in each content area which lead to the discovery of key mathematical relationships;
- gain an historical perspective on the development of mathematics in diverse cultures;
- develop specific methods, ideas, materials, models, and activities for teaching the different content that encourage flexible and resourceful problem solving;
- develop methods and ideas for appropriate uses of technology in both teaching and discovery;
- use the different content areas of mathematics as a source of mathematical models in the natural world;
- develop a strong understanding of the different content areas and their roles in the K–12 mathematics.

Text and Materials

Teaching Student-Centered Mathematics: Grades 5-8, Vol. III, John Van de Walle and Lou Ann Lovin

Technology requirements: Computer access with Internet with sufficient bandwidth to stream online videos (i.e., DSL, Cable modem, or T1/T3). Access to email account. DVD player (television or computer).

Blackboard: Students will be given access to the course website through Blackboard. The course materials will ONLY be accessible when you login to the course website. You must have an email address and update the site to include your active email. All questions and assignments should be emailed to the address provided on the website. All emails MUST have the subject with the course number followed by the student's last name, comma and first name (for example: MTE 500 Smith, John). **To protect the professor's computer from potential viruses, no email will be opened**

unless the subject is in the correct format. It is the student's responsibility to save all work until a final grade has been issued in case they need to be resent.

DVD's: Four DVDs are provided that contain content information for this course. This information is supplemental and should be used by the student to review content information when necessary.

In addition, practice problem sets are located on the course website. They are representative of the content knowledge required on the quizzes and the final exam.

Graphing Calculator: The use of a graphing calculator is required. While participants may use any graphing calculator, the supplemental DVDs use the TI-30 or TI 73. Knowledge and competence for use of other graphing calculators will be the sole responsibility of the participant.

Course Requirements

This course will be offered through Distance Education. Participating teachers may take up to nine months to complete all requirements. There are no scheduled class sessions or meetings. There is an Internet web site that contains practice problems, four activity packets, five quizzes and a cumulative Final Examination. Modules must be completed sequentially. Each module (activity, practice problems, blog entries and quiz) must be COMPLETE prior to beginning the next module.

Each module includes a reading component. Students are expected to use the activity packet essay as a catalyst for analysis of reading content. The essay should reflect not only knowledge of the content but demonstrate a deep understanding of how this knowledge impacts the teaching of mathematics. The content of the reading will also be covered on the quizzes and the final exam.

Each module includes a set of practice problems (answers are included). These problems are recommended (but will not be submitted for grading) to assess the student's recall of the required level of mastery of the mathematical content. If the content knowledge is deficient, the student should use the DVDs to achieve this level since this content will be included on the quizzes and the final exam.

Course Timeline

I. Complete **each** module using the following sequence.

1. Complete practice problems – use DVDs to aid in mastery as needed
2. Complete readings and associated materials
3. Complete Activity Packet (modules 1 – 4)
4. Submit Essay (if assigned)
5. Complete online quiz - Essay must be submitted prior to taking the quiz.

II. Complete Final exam – all modules must be completed prior to taking the exam.

Course Policies

1. The participant must master the material assigned for each module.

2. Participants must complete the four activity packets and the five practice problem sets that are provided on the course web site.
3. Each of the five modules will have an accompanying timed quiz posted on Blackboard. The participant must complete each of these quizzes online.
4. There will be a cumulative final examination. The participants will complete the final exam in the presence of a school or district administrator, have the administrator sign the Proctor Form and mail the Proctor Form and pages used to work out problems on the exam to Tania McDuffie, 226 Hydrick Street, Spartanburg, SC 29306. Students should email the professor to approve an alternate proctoring situation.
5. Blog entries are intended to be an avenue for students to communicate with each other, as well as faculty. Students are encourage to use this tool to share ideas and facilitate discuss about course topics. While students will not be graded on their blog participation, we hope students will see the value in this component of the course and utilize it to enrich their experience.

Grading

Participation as demonstrated through:

Three Activity Essays60%

Quizzes.....25%

Final Exam15%

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Grade Range:

93–100.....A

90–92.....A-

87–89.....B+

83–86.....B

80–82.....B-

77–79.....C+

73–76.....C

70–72.....C-

Below 70F

Course Topics

The topics of this course are arranged by content. While students are expected to have prior knowledge of these specific topics, they will be reviewed on the DVDs and embedded in the pedagogy components of each module.

Module #1 – Numbers and Operations

List of Topics	Complete the following assignments in sequential order. All prior material will be covered on the quiz.
<p>1) Solve problems using fractions, decimals and percents</p> <p>2) Compare and order fractions</p> <p>3) Locate fractions on the number line</p> <p>4) Use ratios and proportions to represent quantitative relationships</p> <p>5) Solve problems involving factors, multiples, prime factorization and relatively prime numbers</p> <p>6) Understand, represent and compare integers</p> <p>7) Understand the meaning and effects of arithmetic operations with fractions, decimals and integers.</p> <p>8) Use properties (associative, commutative...) with integers, fractions, and decimals.</p> <p>9) Solve problems using inverse operations (+/-; x/divide, square/sq root)</p> <p>10) Choose an appropriate approach to a problem (mental arithmetic, pencil and paper, calculator...)</p> <p>11) Analyze and develop fluency in the use of algorithms for computing with fractions, decimals and integers</p> <p>12) Develop and use strategies to estimate the results of rational-number computations and judge the reasonableness of the results.</p>	<p>Required</p> <p>1. <i>Teaching Student-Centered Mathematics: Grades 5-8</i>: Read Chapters 1-5</p> <p>2. Activity #1: Fraction Tracks</p> <p>3. Recommended (but not required): DVD Refresher Content Middle School Mathematics Disk 1</p> <p>4. Content Practice Problems: on website</p> <p>5. Complete Quiz #1</p>

NOTE: You must submit your Activity Essay for activity #1 and take quiz #1 BEFORE you can start Module #2.

Module #2 - Algebra

List of Topics	Complete the following assignments in sequential order. All prior material will be covered on the quiz.
<p>1) Represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules.</p> <p>3) Determine whether a function is linear or nonlinear and contrast their properties from tables, graphs, or equations</p> <p>4) Begin to develop a conceptual understanding of different uses of variables</p> <p>5) Explore relationships between symbolic expressions and graphs of lines</p> <p>6) Investigate slope and y-intercept of lines</p> <p>7) Solve problems using symbolic algebra concentrating on linear relationships</p> <p>8) Simplify and solve linear equations</p> <p>9) Solve problems using various representations, graphs, tables and equations</p> <p>10) Use graphs to analyze the nature of changes in quantities in linear relationships.</p>	<p>Required</p> <p>1. <i>Teaching Student-Centered Mathematics: Grades 5-8</i>: Read Chapter 6 and 9</p> <p>2. Activity #2: The Language of Algebra</p> <p>3. Recommended (but not required): DVD Refresher Content Middle School Mathematics Disk 2</p> <p>4. Content Practice Problems: on website</p> <p>5. Complete Quiz #2</p>

NOTE: You must submit your Activity Essay for activity #2 and take quiz #2 BEFORE you can start Module #3.

Module #3 - Geometry

List of Topics	Complete the following assignments in sequential order. All prior material will be covered on the quiz.
<p>1) Use the defining properties of two- and three-dimensional objects to describe and classify them</p> <p>2) Create and critique inductive and deductive arguments concerning geometric ideas and relationships, such as congruence, similarity, and the Pythagorean relationship</p> <p>3) Use coordinate geometry to represent and examine the properties of geometric shapes</p> <p>4) Use coordinate geometry to examine special geometric shapes, such as regular polygons or</p>	<p>Required</p> <p>1. <i>Teaching Student-Centered Mathematics: Grades 5-8</i>: Read Chapter 7</p> <p>2. Activity #3: Scale Up, Scale Down</p> <p>3. Recommended (but not required): DVD Refresher Content Middle School Mathematics Disk 3</p> <p>4. Content Practice Problems: on website</p>

<p>those with pairs of parallel or perpendicular sides</p> <p>5) Describe sizes, positions, and orientations of shapes under informal transformations such as flips, turns, slides, and scaling</p> <p>6) Examine the congruence, similarity, and line or rotational symmetry of objects using transformations.</p> <p>7) Use two-dimensional representations of three-dimensional objects to visualize and solve problems such as those involving surface area and volume</p> <p>8) Use visual tools such as networks to represent and solve problems</p> <p>9) Recognize and apply geometric ideas and relationships in areas outside the mathematics classroom, such as art, science, and everyday life.</p>	<p>5. Complete Quiz #3</p>
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NOTE: You must submit your Activity Essay for activity #3 and take quiz #3 BEFORE you can start Module #4.

Module #4 - Measurement

<p>List of Topics</p>	<p>Complete the following assignments in sequential order. All prior material will be covered on the quiz.</p>
<p>1) Understand both metric and customary systems of measurement</p> <p>2) Understand relationships among units and convert from one unit to another within the same system</p> <p>3) Understand, select, and use units of appropriate size and type to measure angles, perimeter, area, surface area, and volume</p> <p>4) Estimate measurements</p> <p>5) Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision</p> <p>6) Develop and use formulas to determine the circumference of circles and the area of triangles, parallelograms, trapezoids, and circles and develop strategies to find the area of more complex shapes</p>	<p>Required</p> <p>1. <i>Teaching Student-Centered Mathematics: Grades 5-8</i>: Read Chapter 8</p> <p>2. Activity #4: Volume and Surface Area Challenge</p> <p>3. Recommended (but not required): DVD Refresher Content Middle School Mathematics Disk 4</p> <p>4. Content Practice Problems: on website</p> <p>5. Complete Quiz #4</p>

- 7) Develop strategies to determine the surface area and volume of selected prisms, pyramids, and cylinders
- 8) Solve problems involving scale factors, using ratio and proportion
- 9) Solve simple problems involving rates and derived measurements for such attributes as velocity and density.

NOTE: You must take quiz #4 BEFORE you can start Module #5.

Module #5 – Data Analysis and Probability

List of Topics	Complete the following assignments in sequential order. All prior material will be covered on the quiz.
<p>1) Create graphical representations of data including histograms, box plots, and scatterplots</p> <p>2) Find, use, and interpret measures of center and spread, including mean and interquartile range</p> <p>3) Use observations about differences between two or more samples to make conjectures about the populations</p> <p>4) Use conjectures to formulate new questions and plan new studies to answer them</p> <p>5) Understand and use appropriate terminology to describe complementary and mutually exclusive events</p> <p>6) Use proportionality and a basic understanding of probability to make and test conjectures about the results of experiments and simulations</p> <p>7) Compute probabilities for simple compound events, using such methods as organized lists, tree diagrams and area models</p>	<p>Required</p> <ol style="list-style-type: none"> 1. <i>Teaching Student-Centered Mathematics: Grades 5-8</i>: Read Chapters 11 and 12 2. View videos titled <i>Statistics as Problem Solving</i>, <i>Data Organization and Representation</i>, and <i>Probability</i> from http://www.learner.org/resources/series158.html 3. Recommended (but not required): DVD Refresher Content Middle School Mathematics Disks 5 and 6 4. Content Practice Problems: on website 5. Complete Quiz #5