course_prefix & number: EDE 8163

Course Title: Teaching Middle Level Mathematics Content

Credit Hours: 3 Semester Hours

Course Type: Lecture

Catalogue Description: Three hours lecture. Field based. Research-based pedagogy and current issues and perspectives of teaching the content of algebra, geometry, measurement and data analysis and probability in middle school.

College of Education Conceptual Framework:

The faculty in the College of Education at Mississippi State University are committed to assuring the success of students and graduates by providing superior learning opportunities that are continually improved as society, schools, and technology change. The organizing theme for the conceptual framework for the College of Education at Mississippi State University is educational professionals - dedicated to continual improvement of all students’ educational experiences. The beliefs that guide program development are as follows:

1. KNOWLEDGE - Educational professionals must have a deep understanding of the organizing concepts, processes, and attitudes that comprise their chosen disciplinary knowledge base, the pedagogical knowledge base, and the pedagogical content knowledge base. They must also know how to complement these knowledge bases with the appropriate use of technology.

2. COLLABORATION - Educational professionals must continually seek opportunities to work together, learn from one another, forge partnerships, and assume positions of responsibility.

3. REFLECTION - Educational professionals must be willing to assess their own strengths and weaknesses through reflection. They must also possess the skills, behaviors, and attitudes necessary to learn, change, and grow as life-long learners.

4. PRACTICE - Educational professionals must have a rich repertoire of research-based strategies for instruction, assessment, and the use of technologies. They must be able to focus that array of skills on promoting authentic learning by all students or clients, while exhibiting an appreciation and commitment to the value and role of diversity.
Course Objectives:

Upon completion of this course, the candidate will be able to:

1. Describe theories of adolescent development and learning and the implications of these in the teaching and learning of middle level Algebra, Geometry, Measurement, and Data Analysis and Probability. [AMLE 1a, 1b, 1c, 4a, 4b, 4d; CFPO 1, 2]

2. Describe theories of mathematical development concerning transitioning from arithmetic thinking to algebraic thinking and the implications of these in the teaching of middle level mathematics concepts. [AMLE 1a, 1b, 1c, 4a, 4b, 4d; CFPO 1, 3, 11, 12, 13, 14]

3. Plan and implement tasks or activities using a problem solving approach in teaching middle level mathematics concepts of Algebra, Geometry, Measurement, and Data Analysis and Probability where students necessarily are actively engaged in reflective thought. [AMLE 1c, 1d, 2a, 2c, 4b, 4c; CFPO 1, 3, 5, 8, 11, 12, 14]

4. Plan developmentally appropriate mathematics instruction in Algebra, Geometry, Measurement, and Data Analysis and Probability for middle school students of different cultural and linguistic backgrounds, ages, and exceptionalities, particularly for those residing in rural communities. [AMLE 1b, 1c, 2a, 4a, 4b; CFPO 1, 2, 3, 5, 11, 12]

5. Critique and integrate various grade appropriate mathematical resources, such as concrete and virtual manipulatives, tutorial web-sites, simulation programs, and dynamic geometry and data analysis software, into standards-based mathematics teaching for rural students in grades 4-8. [AMLE 1a, 1c, 2a, 2b, 4a, 4b; CFPO 1, 2, 3, 5, 7, 11, 12, 14]

6. Develop and use grade appropriate assessment and evaluation tools, based on common mathematical misconceptions, that meet the assessment principle set forth by the National Council of Teachers of Mathematics and that inform students’ understanding, needs, and learning of middle school mathematics concepts focused on Algebra, Geometry, Measurement, and Data Analysis and Probability. [AMLE 2b, 4c; CFPO 1, 3, 4]

7. Describe and apply the most current research findings in the teaching of middle school mathematics concepts of Algebra, Geometry, Measurement, and Data Analysis and Probability. [AMLE 1c, 2b, 4a, 4b; CFPO 1, 3, 5, 8, 11, 13, 14]

8. Design and implement middle school mathematics lessons that address the Common Core State Standards for Mathematics, Domains related to Algebra, Geometry, Measurement, and Data Analysis and Probability, and facilitate the eight Standards for Mathematical Practice while teaching. [AMLE 1a, 1b, 1c, 2a, 2b, 2c, 4a, 4b; CFPO 1, 3, 5, 11, 12, 14]

Topics to be Covered:

The course topics include:

a. Transitioning from Arithmetic Thinking to Algebraic Thinking (5 hours)
   — Additive versus Multiplicative Thinking
   — Properties of Numbers
   — Repeating & Growing Patterns
   — Common Misconceptions & Error Patterns

b. Algebra in the Middle School (10 hours)
   — Expressions & Equations
   — Radicals & Integer Exponents
   — Slope & Systems of Linear Equations
   — Functions
   — Common Misconceptions & Error Patterns

c. Geometry & Spatial Visualization in the Middle School (11 hours)
— Van Hiele Theory of Geometric Thought
— Points, Lines, Planes
— 2-D and 3-D Shapes
— The Pythagorean Theorem
— Problem Solving with Geometric Contexts
— Promoting Spatial Visualization
— Common Misconceptions & Error Patterns

d. Measurement in the Middle School (10 hours)
— Attributes of Measurement: Length, Area, Surface Area Volume, Angle Measure
— Development & Application of Measurement Formulas
— Converting Among and Within Systems of Measurement
— Common Misconceptions & Error Patterns

e. Data Analysis & Probability in the Middle School (6 hours)
— Representing & Interpreting Data
— Variability, Distributions & Inferences
— Chance Processes & Probability Models
— Bi-Variate Data
— Common Misconceptions & Error Patterns

f. Discrete Mathematics in the Middle School (3 hours)
— Map Coloring
— Vertex-Edge Graphs
— Properties and Applications of Vertex-Edge Graphs

Require3d Texts:


Math Manipulatives Kit which includes, but is not limited to, Algebra Tiles, Cuisenaire Rods, Base-10 Blocks, Color Tiles, 2-Color Counters, Spinners, 2 and 3-Dimensional Shape Models, and Pattern Blocks.

Recommended Resources (available for purchase online at www.nctm.org):


Methods of Instruction:

A variety of methods of instruction will be employed. This class is designed to prepare candidates to teach mathematics in the grades 4 – 8 classroom; therefore the professor will model teaching techniques appropriate for the middle level mathematics classroom through web-based videos. Additionally, Power Point presentations, supplementary web-based lecture notes and commentary, assigned course readings, on-line class discussions, and computer laboratory work completed at various NCTM and virtual manipulative websites will be employed. Finally, candidates will be engaged in hands-on, manipulative activities which will be digitally photographed or video-taped and subsequently electronically submitted to the professor for review and informal/formative assessment.

Suggested Student Activities:

- **Article Questions:** For each broad course topic, a research-based journal article that relates to that topic will be assigned. You are to thoroughly read each article and answer the corresponding questions posted within the Assignments tab of MyCourses. All answers to assigned article questions should be typed in a Word document and attached to the assignment submission, as with all assignments. These answers are to be submitted to the professor on or before the assigned due date – see individual Learning Module Agendas. All answers are to be professionally written in grammatically correct sentences. (Course Objectives: 1, 5, 7)

- **Individual Assignments/Activities and Participation:** You will complete various activities aligned with the course topics throughout the semester (as described in MyCourses Assignments). All assignments/activities must be completed in order to receive a grade in this course. Evidence of the completion of each Learning Module’s activities will be through either digital pictures, discussion board posts, or completion of recording sheets submitted electronically to the professor through the Assignments tab of MyCourses. All documents submitted are to be either PDFs of Word documents or PDFs from scanned documents. No other types of documents are accepted. (Course Objectives: 1, 2, 3, 4, 5, 6, 7, 8)

- **POD Journal:** You are to maintain an electronic POD (Problem of the Day) problem solving journal within the discussion board area of the course which contains (1) a typed statement of each of the PODs given on the first slide of each daily Power Point; (2) your solution to that POD, including all work/computations which led to the answer; and (3) a written explanation of how you derived your solution and why you did what you did to solve the POD, in complete sentences within two separate paragraphs. The POD journal is an individual course requirement and as such, the contents of your POD journal should be original work. Full credit will not be given if no written explanation is provided. (Course Objectives: 3, 4, 6)

- **Misconception/Error Pattern Remediation Lesson Plan:** Each partner group will be assigned one of the Common Core Domains related to Algebra, Measurement, Geometry, or Data Analysis & Probability. Based on relevant research findings obtained through library research, you will identify a common misconception associated with the assigned standard. Then, you will create a lesson plan (using the Basic Lesson Plan Format found of TaskStream) that could be used to alleviate or prevent this misconception. The lesson plan is to use concrete or virtual manipulatives to enhance student understanding and address at
least one Common Core Content Standards and at least three Standards for Mathematical Practice. You are to submit the completed lesson plan and all materials necessary to implement the lesson electronically, as well as a statement of the misconception identified with examples of “student work” demonstrating the misconception. (Course Objectives: 1, 2, 3, 4, 6, 8)

• **Research Project:** Based on an assigned Common Core Domain, each partner group will be responsible for locating two research journal articles describing current research-findings on that Common Core Domain and two “how-to” practitioner-based journal articles from NCTM published journals (namely, *Teaching Children Mathematics* or *Mathematics Teaching in the Middle School*), which explain how to teach a topic within the assigned Common Core Domain. After reading all 4 journal articles, you are to (1) write a summary paper synthesizing and explaining the content of the four articles; (2) create a lesson plan using the Basic Lesson Plan Format of TaskStream, which implements activities published in one or more of the “how-to” articles and uses effective research-based pedagogy as described in the research articles; and (3) individually, write a reflection detailing what was learned by completing this project. You are to submit the completed summary paper, lesson plan and individual reflection to the professor electronically. (Course Objectives: 1, 3, 4, 5, 7, 8)

• **Content Exams:** You will take four pedagogical content knowledge exams, one for each of Algebra, Geometry, Measurement, and Data Analysis & Probability, which will be based on knowledge gained through class activities/discussions, textbook readings and field experiences. (Course Objectives: 1, 2, 3, 7, 8)

• **Final Exam:** You will take a cumulative final exam based on knowledge gained through class activities/discussions, textbook readings and field experiences. (Course Objectives: 1, 2, 3, 7, 8)

• **Field Experience - One-on-One Teaching:** For this assignment, you will engage in an activity that allows you to put the knowledge and skills gained in this course to use while working with a middle school student. You must arrange to teach a middle school student (grades 4 – 8) of your choice in the area of **mathematics for 9 contact hours** (a contact hour means you’re working with your student during that hour) – 3 hours a week for 3 weeks. After you determine who you will be teaching, you are to set times and dates that the teaching will occur, which reflect 3 hours a week for 3 weeks. This information, along with a signature of one of the student’s parents, is to be submitted electronically to the professor by the “Teaching Schedule” deadline. Use the “Teaching Schedule” form provided in the MyCourses Assignments tab. All teaching must be approved by the professor prior to engaging in it. During the first hour, you will administer a pre-test to the student, provided by the professor. Then during the last hour of teaching you will administer, the exact same test, as a post-test. You will complete 8 specific activities with your student during the 2nd through 9th hours which will be provided by the professor. Each time you meet with your student, you are to document the time, date and what was accomplished during each session (keep a running log of times, dates, and accomplishments) and have the student sign it each time that you meet just before you leave. Use the “Time Documentation” form provided in the MyCourses Field Experience folder. The total amount of time shown on this log must be at least 9 hours. This log is to be electronically submitted to the professor with the hourly and final reports. For each hour of teaching, you are to complete an Hourly Report of
Teaching using the prompts provided by the professor – see MyCourses Field Experience folder. Upon completion of the project, you are to electronically submit, the Time Documentation form, 9 Hourly Reports, a reflective Final Report (at least three pages and no more than 5 double-spaced, typed pages) describing this experience (including error analyses of the errors made by your student, and pre- and post-test scores) – see the MyCourses Field Experience folder for Final Report prompts. You are also to submit to the professor ALL ORIGINAL work of the student, via U. S. Postal system, UPS, or delivery in person. (Course Objectives: 3, 4, 6, 8)

**Honor Code:**

Mississippi State University has an approved Honor Code that applies to all students. The code is as follows:

“As a Mississippi State University student I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do.”

Upon accepting admission to Mississippi State University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor Code. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the MSU community from the requirements or the processes of the Honor Code.

For additional information visit: http://www.honorcode.msstate.edu/

Please note that **Plagiarism** is defined and clarified within the honor code as follows:

1. **Plagiarism:**
   The appropriation of another person's ideas, processes, results, or words without giving appropriate credit.

   **Clarification:**
   a. Intentionally, knowingly, or carelessly presenting the work of another as one's own (i.e., without proper credit).
   b. Failing to credit sources used in a work product in an attempt to pass off the work as one's own.
   c. Attempting to receive credit for work performed by another, including papers obtained in whole or in part from individuals or other sources.
   d. The internet, data bases and other electronic resources must be cited if they are utilized in any way as resource material in an academic exercise.

   **General information pertaining to plagiarism:**
   a. Faculty members are responsible for identifying any specific style/format requirement for the course. Examples include, but are not limited to, American Psychological Association (APA) style and Modern Languages Association (MLA) style.
   b. Direct Quotation: Every direct quotation must be identified by quotation marks or appropriate indentation and must be properly acknowledged in the text by citation or in a footnote or endnote.
   c. Paraphrase: Prompt acknowledgment is required when material from another source is paraphrased or summarized, in whole or in part, in one's own words. To acknowledge a paraphrase properly, one might state: "To paraphrase Locke's..."
comment,..." and then conclude with a footnote or endnote identifying the exact reference.

d. Borrowed facts: Information gained in reading or research, which is not common knowledge, must be acknowledged.

e. Common knowledge: Common knowledge includes generally known facts such as the names of leaders of prominent nations, basic scientific laws, etc. Materials, which add only to a general understanding of the subject, may be acknowledged in the bibliography and need not be footnoted or endnoted.

f. Footnotes, endnotes, and in-text citations: One footnote, endnote, or in-text citation is usually enough to acknowledge indebtedness when a number of connected sentences are drawn from one source. When direct quotations are used, however, quotation marks must be inserted and acknowledgment made. Similarly, when a passage is paraphrased, acknowledgment is required.

Technology:

Technology will be used in both the delivery of the course content and through course requirements completed by teacher candidates. Delivery of the course will be web-based through the Internet and therefore, delivery of the course content will utilize Power Point Presentations, supplementary web-based lecture notes and commentary, on-line class discussions, and computer laboratory work completed at various NCTM and virtual manipulatives websites. All course assignments will be completed using appropriate software tools. One lesson plan will require the use of appropriate technological tools in enhancing mathematics instruction. Finally, teacher candidates will be engaged in hands-on, manipulative activities which will be self-video-taped, as appropriate, and subsequently electronically submitted to the professor for review and informal/formative assessment. The technology requirements of the course are as follows:

- Computer with High Speed Internet Access via DSL or equivalent broadband connectivity option (traditional dial-up Internet services do not provide adequate support to the technologies used within the course)
- Required Browser: Mozilla Fire Fox (Version 3 or higher); verify that your browser is supported by using the Check Browser feature in MyCourses
- Download the latest version of Adobe Acrobat Reader; this can be downloaded at http://get.adobe.com/reader/otherversions/
- Download Adobe Media
- Download Adobe Flash
- Download Shockwave Flash
- Download or upgrade to the latest version of Java
- Download Quicktime Player; this can be downloaded at http://www.apple.com/quicktime/download/
- Download the “Lockdown Browser” in order to complete assessments
- All Pop-Ups must be turned OFF when using MyCourses
- To check your Browser, click on “Check Browser” in the top right corner of the course listings page after you log in to MyCourses. You must have a GREEN check on each item listed BEFORE beginning your course.
- Frequent access to a digital camera and scanner. You will need to be able to take digital pictures of the results of most of the class activities then submit them to your professor within PDF-Word documents so they can be viewed and evaluated. You will also need to be able to scan documents and convert them to PDFs to then submit to the professor.
Diversity:

Diversity, within the context of the elementary mathematics classroom, will be addressed throughout the course. It will be discussed as part of the Equity Principal and in terms of appropriate mathematics instructional and assessment strategies for teaching Algebra, Geometry, Measurement, Data Analysis & Probability and Discrete Mathematics to meet the needs of diverse learners.

Disability:

In accordance with section 504 of the 1973 Rehabilitation Act and the Americans with Disabilities Act, Mississippi State University reasonably accommodates students who demonstrate, through appropriate documentation, a qualified disability. The department of Student Support Services (SSS) is the designated unit on campus where students with disabilities identify themselves when requesting academic accommodations. For additional information, contact SSS at 325-3335.

Field Component:

The course will have a field component which will allow teacher candidates to work one-on-one with local middle school students in both enrichment and Response to Intervention activities. The specific field requirements for each assignment are previously described under “Suggested Student Activities”.

Evaluation of Student Progress:

This course uses a grading scale of 1000 points. The points needed for each letter grade are detailed below. In this graduate level course, earning an “A” will require a demonstration of mastery of the course objectives. A “B” represents quality, acceptable work. Grades will be determined by the points earned in both academics and fieldwork. No late work will be accepted for credit in EDE 8163 regardless of point value.

Grading Scale:

1000-930 pts = A  
929-860 pts = B  
859-790 pts = C  
700-789 pts = D  
699 pts & below = F

COURSE ASSIGNMENTS/ACTIVITIES:

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<th>Assignment</th>
<th>Points</th>
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<td>Misconceptions/Error Patterns Lesson Plan</td>
<td>75 pts</td>
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<tr>
<td>Research Project</td>
<td>150 pts</td>
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<tr>
<td>Article Questions (5 @ 20 pts)</td>
<td>100 pts</td>
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<td>Content Exams</td>
<td>240 pts</td>
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<td>Individual Activity Assignments &amp; Participation</td>
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<td>Problem Solving Journal</td>
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<td>Final Exam</td>
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<td>Teaching (9 Hours) &amp; Report</td>
<td>105 pts</td>
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<tr>
<td>Professional Dispositions</td>
<td>10 pts</td>
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ATTENDANCE POLICY:

All candidates are required to complete each learning module according to the deadlines set on the course web-site and course calendar. Additionally, all candidates are expected to meet all field experience requirements. This includes teaching a middle school student for 9 contact hours, for EDE 8163, with an approved teaching schedule. Other field experience requirements are completion of two structured observations. All assignments, including daily class activities, must be completed and submitted to the instructor in order to pass the course with a “C” or higher. Candidates cannot choose to opt out of an assignment; i.e. all assignments and courses activities must be submitted to the professor, regardless of the number of points to possibly be earned.

RESPECT/COURTESY/NETIQUETTE:

Candidates will treat each other and the professor with respect and courtesy. Communication in online courses is different than in face to face courses. Please maintain appropriate netiquette; e.g. class etiquette in virtual classrooms. These basic rules should be adhered to:

1. Remember that you’re not exchanging ideas with a computer but other people – your classmates and your instructor.
2. Avoid “shouting,” that is, typing in all caps or using excessive exclamation points. It is usually not received well.
3. Do not “flame”, that is, send angry or confrontational email. Discussions and debates should remain calm and respectful. Avoid saying anything that you would not say to someone in person.
4. Respect others’ privacy. Do not forward personal messages sent to you.
5. Be conservative in forwarding anything to others. Make sure it’s relevant to the discussion.
6. Be considerate of others’ time.
7. Be forgiving of others’ mistakes. Some individuals may have less experience than you.
8. Do not post personal postings (i.e., My band is playing at Rick’s Friday night. Hope you’ll come). All postings should be directly related to course content.
9. Do not use internet/texting acronyms (i.e., LOL). Everything should be communicated in Standard English, using correct grammar and complete sentences.

Bibliography:


