EDSE 660:  
Teaching Mathematics with Manipulatives, Grades 7-12

I. Descriptive Information:

A. Course Number and Title: EDSE 660: Teaching Mathematics with Manipulatives, Grades 7-12
B. Catalog Description: Methods and materials for using manipulative devices to teach middle and high school level mathematics.
C. Credit: 3 hours (undergraduate or graduate)
D. Prerequisite: none
E. Intended Audience: middle and high school teachers of mathematics
F. Instructor: Dr. Ed Dickey

II. A. Goals: The Collaborative Educational Leader in mathematics will develop

1. an understanding of how hands-on manipulative devices support teaching and learning within the five content area of the South Carolina Mathematics Academic Standards.
2. an appreciation of how manipulative devices can address the learning needs of a diverse population of mathematics learners.
3. skills needed to use manipulative devices in the teaching of mathematics.
4. skills to assess if manipulative devices foster understanding of mathematics.

B. Objectives: The Collaborative Educational Leader in mathematics will:

1. develop skills needed to select and use manipulative devices for teaching about numbers and numeration systems.
2. develop skills needed to select and use manipulative devices for teaching about probability and statistics.
3. develop skills needed to select and use manipulative devices for teaching about patterns, relationships, and functions.
4. develop skills needed to select and use manipulative devices for teaching about algebra concepts and operations.
5. develop skills needed to select and use manipulative devices for teaching about geometry and spatial sense.
6. develop skills needed to select and use manipulative devices for teaching about measurement.
7. develop the ability to construct alternative assessment techniques involving the use of manipulative devises in the teaching of mathematics.
8. identify strategies for using manipulatives in the teaching of mathematics cooperatively.
9. identify strategies for using manipulatives in the teaching of mathematics within realistic contexts.
III. Required Text and Materials:

- Middle and High School Mathematics Manipulatives Kit including overhead set of Algebra Lab Gear, overhead geoboard, Mira, and other devices.

IV. Academic Requirements:

1. Viewing all videotapes or DVDs.
2. Completion of all homework assignments.
3. Submission of four Lab Assignments.
4. Submission of Assessment Project (graduate students only).
5. Final examination.

V. Administrative Requirements:

1. All students must have access to items in the supplied manipulative kit.
2. Submission of Lab Assignments on or before due dates (to be specified).
3. Submission of Assessment Project as described below on or before due date.
4. Submission of a Final Examination on or before due date.

VI. Evaluation:

Grading will be on a traditional A-F scale. The Lab Assignments will account for 20% of the final grade, the Project will account for 45%, and the Final Examination will account for 35%. For undergraduate students, the Lab Assignments will account for 40% of the final grade and the Final Examination will account for 60% of the grade.

93-100=A  86-92=B+  80-85=B  76-79=C+  70-75=C  60-69=D  0-59=F

VII. Topics:

1. Manipulatives: What and Why?
2. Integers and Integer Arithmetic
3. Rational Numbers
4. Data Analysis
5. Probability and Statistics
6. Patterns
7. Algebra: Multiplication and Factoring
8. Algebra: Polynomial Arithmetic
9. Algebra: Equations
10. Geometry: Triangles and Polygons
Assessment Project for EDSE J660

Throughout this course, we have highlighted how different assessment strategies might be used to gain information about student learning in mathematics. In this project, you will develop an assessment strategy and rubric to be used with a mathematics lesson involving manipulatives. Your project will consist of four sections: 1. The Lesson, 2. The Assessment Strategy, 3. Student Work, and 4. The Scoring Rubric.

1. **The Lesson.** Select one of the strands from the South Carolina Mathematics Academic Standards. Describe a lesson within that strand involving one or more manipulatives for students in any grade between 7 and 12. The lesson may be something you have taught before or something you have read about in a journal such as the Mathematics Teacher or a book such as one of the Addenda Series books. The lesson may NOT be something that is covered in the videotapes or Study Guide for this course. This section need not be very detailed but should include enough information so that the reader can have a clear idea of what has happened in the classroom. Be sure to include the instructional objective(s) for this lesson, that is, state clearly what you expect students to learn and be able to do as a result of completing the lesson.

2. **The Assessment Strategy.** Describe an assessment strategy for the lesson you have selected. The assessment strategy you select must be one of the five we have highlighted in this course: writing, performance tasks, observations, portfolios, and extended investigations. This section should include a detailed description of what the students will do in the assessment activity. For example, if the assessment strategy is a writing task, describe what they will do prior to writing, provide any writing prompts you think they might need, and produce the instruction sheet they will receive. Be sure to list the manipulative(s) used and clearly describe their role in the assessment. The assessment strategy should relate to at least one of the objectives of the lesson, that is, through this assessment strategy you will gain information about how well students have learned what they were supposed to learn or how well they can do what it was they were supposed to be able to do as a result of completing the lesson.
3. **Student Work.** Produce at least one example of student work based on the assessment strategy you described in #2. If you have access to students, the easiest way to do this is have them use the assessment strategy and submit a copy of their work. If you have no access to students or teen-agers who can act like students, you will need to make up a response on your own.

4. **Scoring Rubric.** Develop a scoring rubric to assess student work using your assessment strategy. The rubric must have at least four levels (assuming one level is no response). Score the sample student work from #3 using your rubric including an explanation of how the score was derived.

**Scoring Rubric for this Assessment Project**

Each of the sections above will be assessed 0, 1, 2, or 3 points:

- **0 points** -- section not addressed
- **1 point** -- significant information is missing or not described clearly; another teacher would not understand how to implement what is being described
- **2 points** -- only minor items are not addressed; a few parts are not clear; most teachers would understand how to implement what is being described
- **3 points** -- all items are fully addressed; all descriptions are clear; teachers would find this easy to implement