William Paterson University  
College of Education  
Department of Middle and Secondary Education  

Course of Study

Theme - Preparing Inquiring Educators: Knowledge, Understanding, and Application

1. Course Title and Credits: Methods of Teaching Secondary Mathematics - CISE 413  
   3 Undergraduate Credits

2. Course Description:  
   Learning and assessment of mathematics, at the high school and middle school, levels are understood and applied according to the recommendations of the National Council of Teachers of Mathematics and the guidelines of the New Jersey Core Curriculum Content Standards. Strategies of teaching whole class and small groups, hands-on problem solving and posing experiences, integrating mathematics across and within the curriculum, technology applications and applications of mathematics in the real world experiences are explored in depth. This course is coordinated with a second level practicum experience in a 7-12 mathematics classroom.

3. Prerequisite: CISE 321  
   Co-requisite: CISE 290

4. Course Objectives: The students will demonstrate:  
   1. Knowledge of the current standards for curriculum and assessment in mathematics, supported by the National Council of Teachers of Mathematics and New Jersey Core Curriculum Content Standards.  
   2. Strategies for active mathematics learning in N-12, including options for cooperative learning in the classroom.  
   3. Strategies for integrating mathematics across the curriculum and with other content areas, including project methods of teaching and assessment.  
   4. Strategies for improving communication in mathematics, including the use of trade books and writing to learn mathematics.  
   5. The ability to plan, implement, and evaluate laboratory and problem solving experiences appropriate for diverse communities of learners.  
   6. The ability to plan, implement and evaluate laboratory and problem solving experiences utilizing modeling, simulations and experiences with manipulative materials.  
   7. The ability to plan, implement, and evaluate laboratory and problem solving experiences that enable students to develop an understanding of the complex relationships among mathematics, technology, society and human values.  
   8. The ability to apply knowledge of Internet and other resources for teaching, learning and assessing mathematics.  
   9. The ability to apply knowledge of other current technology resources such as graphing calculators and software packages for teaching, learning and assessing mathematics.
10. Strategies of planning and evaluating educational experiences that incorporate historical perspectives on mathematics.

5. **Student Learning Outcomes:**

1. In order for students to develop an intuitive sense of age-appropriate and grade-appropriate curriculum, they will conduct a **textbook analysis**. Students will choose two current textbooks for the grade to which they are assigned for their practicum. They will work collaboratively to compare these texts according to given guidelines. Each group will function as a committee and recommend one of the textbooks.

   - NJCCCS: 4.1-4.5
   - NJ TEACHING STANDARDS: ALL
   - NCTM SPA: ALL
   - WPU Competencies: ALL

2. Students will **create and present lessons** in Algebra, Geometry, Trigonometry, Calculus and Probability and Statistics. Lessons must be prepared and presented in accordance with the NCTM and New Jersey Core Curriculum Standards.

   - NJCCCS: 4.1-4.5
   - NJ TEACHING STANDARDS: 1-8, 10
   - NCTM SPA: ALL
   - WPU Competencies: 1-6, 8-9, 12-13, 16-20

3. Students will **assess lessons** prepared by the instructor and/or other students as a part of their preparation according to the assessment standards proposed by the NCTM. They will create their own rubric for open-ended assessment items. Students will also develop items for their own final examination.

   - NJCCCS: 4.1-4.5
   - NJ TEACHING STANDARDS: ALL
   - NCTM SPA: ALL
   - WPU Competencies: 1-6, 8-9, 12-13, 16-20

4. Students will review and present **current research** in middle and secondary school mathematics education.

   - NJCCCS: 4.1-4.5
   - NJ TEACHING STANDARDS: ALL
   - NCTM SPA: ALL
   - WPU Competencies: 2, 8-10, 12, 16, 19-20

5. In order for students to learn how to integrate mathematics across the curriculum - in a meaningful way, they will design, conduct and present an **integrated mathematics**
project. Students will choose a plant, an animal, or any natural phenomena, such as weather, to observe throughout the semester. They will keep a daily journal as they observe and measure all changes such as temperature, rainfall, humidity, weight, height, and number of parts - such as leaves. Students will use graphs and other methods to represent and present collected data.

NJCCCS 4.1-4.5 FOCUS - OTHERS POSSIBLE
NJ TEACHING STANDARDS ALL
NCTM SPA ALL
WPU Competencies 1-6, 8-9, 12-13, 16-20

6. **Topical Outline of Course Content:**

1. Strategies for teaching mathematics in N-12
   A. Problem solving and posing approaches
   B. Constructivist teaching and learning
   C. Communicating effectively about mathematics in a variety of formats
   D. Patterns, data collection and the experimental method
   E. Project methods of teaching and assessment
   F. ABC (activity before content) versus alternatives
   G. Cooperative learning options
   H. Options for making all education multicultural

2. Assessment strategies for mathematics
   A. Observation
   B. Portfolios
   C. Performance tasks
   D. Clinical interviews
   E. Student self-assessment
   F. Attitudes and interest in the context of content knowledge
   G. Formal testing
   H. Cultural issues in the assessment of students

3. Technology in mathematics
   A. Graphing calculators
   B. Current dynamic software packages and laser disk problem solving curricula
   C. Internet resources including news groups, computer conferencing and role-playing simulations
   D. Video packages promoting understanding of learning mathematics
   E. Promote writing to learn mathematics

4. Applications and models of mathematical content
   A. Modeling with concrete materials
   B. Simulations of real world contexts (personal, business, scientific)
   C. Projects and problem solving as vehicles for teaching and learning mathematics
D. Data collection for reports as part of statistics learning
E. Applications of matrices
F. Political topics in mathematics
G. Journalism and other media and mathematics

5. Connecting mathematics across the curriculum
A. Approaching mathematics/technology/society/human values as an interdisciplinary topic
B. Using fiction and non-fiction trade books
C. Thematic unit planning for integrated Vs subject specific learning
D. Students as authors
E. Building interdisciplinary projects with teachers from other subject fields
F. Data collection and analysis

6. Recent and future trends in mathematics education
A. Conflicting links among problem solving, problem posing and theories of moral reasoning
B. Race, gender and ethnicity concerns at the forefront of current reform efforts
C. Evaluation of currently popular curriculum packages and text books
D. Diversity in mathematics
E. Introduction of statistics, discrete mathematics and computer science as alternatives to calculus in the secondary curriculum
F. Examination of the history of mathematics in view of current trends
G. Exploration of changing standards documents and interpretations of existing documents
H. The relationship of current research to historical perspectives

7. Applications of research in mathematics education
A. Resources for relevant research and maintaining current professional knowledge (e.g., professional associations, journal of professional associations, ERIC)
B. Translating statistical research results into classroom practices
C. Evaluating effectiveness of curricular reform
D. Classroom research as a tool for implementing standards
E. Examining links between theories in psychology, philosophy of mathematics, social and cultural theories of education and mathematics education research

7. Guidelines and Suggestions for Teaching Methods:
1. Analysis and discussion of assigned readings
2. Cooperative group problem solving projects
3. Simulations and Role playing
4. Independent research
5. Role play exercises
6. Lecture and demonstration
7. Case study analysis (video and written)
8. Planning, implementation and videotaping of practice lessons
9. Critique of mini-lessons
10. Informal and formal assessments of children
11. Logs of everyday math experiences
12. Utilization of Curriculum and Materials Library

8. Guidelines and Suggestions for Methods of Student Assessment
1. Portfolios containing lesson plans, assessment projects, math autobiographies, content tests, critiques of mini-lessons
2. Lesson plan presentations
3. Textbook analysis and review of supplementary material
4. Mid-semester and/or final examination(s)
5. Research presentation
6. Class participation
7. Real-life Project and presentation

9. Suggested Textbook(s):
1. Brahier. _Teaching Secondary and Middle School Mathematics and Science_. (Most recent edition)

10. Bibliography:


11. Preparers’ Names: Professors Peter Appelbaum, Rochelle Kaplan and Althea Hylton-Lindsay

11. Original Departmental Approval Date: 1995

12. Reviser’s Name: Althea Hylton-Lindsay

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13. Departmental Revision Approval Date: Spring 2005