

MATHEMATICS EDUCATION CAPSTONE

MTCH 4800/8806

Course Description:

This capstone course for preservice and in-service teachers is intended to help connect the undergraduate mathematics curriculum to the secondary mathematics curriculum. Course topics include functions, equations, algebraic structures, congruence, trigonometry, and calculus. Topics are explored via strategies useful for studying mathematics called concept analysis and problem analysis. **3 credits**

Prerequisites:

MATH 4030 with a C or better or Math 3640 with a C or better.

Overview of Content and Purpose of the Course:

Recently, there has been an increasing focus in the field of mathematics education on the mathematical preparation of pre-service teachers. Major organizations, such as the National Council of Teachers of Mathematics and the American Mathematical Society, have recommended that pre-service secondary teachers take a capstone course as part of their undergraduate experience. This type of course is also useful for in-service teachers such as those taking the MAT degree.

The course is intended to help secondary mathematics teachers make connections between undergraduate mathematics and the mathematics that they teach or eventually will teach. Concept analysis is one feature of the course. In this feature, typical topics and concepts from secondary mathematics will be revisited but from an advanced perspective. Part of this feature involves unpacking mathematical structures typically taught in undergraduate mathematics and applying these structures to secondary mathematical topics. This unpacking and application of mathematics is a vital component of mathematical understanding that teachers need.

Another feature of the course would be problem analysis. In this feature, the course will study and extend typical secondary mathematics problems, such as Person A starts out going 40 mph and Person B starts out from the same spot and going the same direction, but 3 hours later, going 70 miles per hour. How long does it take person B to catch up to person A? Problems are analyzed by trying to understand the problem, generating different types of solution (i.e. algebraic and geometric), and, finding analogous problems. Problems are then extended by finding related applications, changing the givens, changing the unknowns, and changing the domain/range. A goal of the course is to develop mathematically sophisticated secondary teachers. Such teachers should be able to connect related mathematical ideas, and extend them in powerful ways.

Anticipated Audience/Demand:

Preservice secondary mathematics teachers will need this course to satisfy their major requirements. Masters of Arts of Teaching in Mathematics (MAT) students, usually in-service secondary mathematics teachers, may take this course as an elective.

Major Topics:

1. Problem Analysis
2. Concept Analysis
3. Probability and Statistics
4. Generalized Distance
5. Historical algorithms of arithmetic
6. Modular Arithmetic
7. Inference testing and p-value meaning
8. Proof and Justification
9. Linear Algebra and Algebraic properties
10. Number representations and cognition

Methods:

The course will be taught with a combination of class lecture, discussions, technology activities, and some group work.

Student Role:

Students are expected to learn the content of the course via solving problems, lecture, mathematical programs, concept analyses and problem analyses.

Textbook:

Course Pack available online via the Blackboard Course Management system.

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