Math 602 Research & Practice – Arithmetic

Catalog description: In this course we explore: arithmetic, algebra, and data analysis at the Middle Childhood/Early Adolescence level as defined in the Common Core State Standards for Mathematics; best practices and methodologies for teaching this content; and relevant research in teaching and learning mathematics. A five-hour practicum is required. (*Prerequisites:* Math 101 with a grade of C or above and successful completion of Core I.)

Student will demonstrate each of the following abilities.

Regarding professional standards:

- State each of the six NCTM Principles and the five Standards.
- Identify, with justification, principles and standards addressed within specific examples of lesson plans.
- Identify, with justification, the grade band/s (corresponding with NCTM *Principles and Standards for School Mathematics* and the *Common Core State Standards for Mathematics*) in which a given problem might occur.
- Analyze a unit from a mathematics curriculum that is currently in use in area school districts.

Regarding professional standards and formal pedagogy:

- Articulate basic structure of a lesson plan and explore a specific type (Review-Teach-Practice, Investigate/Problem-Based, or Direct Instruction)
- Articulate learning objectives using the language of Bloom's taxonomy.
- Construct (original or based on materials explored within the course) classroom activities around a variety of different types of goals: concept introduction, exploration, reinforcement and generalization.

Within arithmetic concepts and skills:

- Represent or model numbers in multiply many ways (e.g. number line, geometric representation, as a fraction, or proportion).
- Represent or model operations on numbers in multiply many ways.
- Evaluate various representations for effectiveness in the context of problem solving.
- Identify the CGI problem types, articulate common learner strategies and create original examples.
- Evaluate solutions to arithmetic problems for correctness, validity, efficiency and potential for extension/development
- Compose and decompose numbers by place-value (for 10 as well as for other bases), as a product of primes, as equivalent fractions.
- Use and justify a variety of different algorithms for performing basic arithmetic operations on integers, fractions, and decimal numbers; and evaluate alternative algorithms for correctness, efficiency and extendibility.
- Construct (original or based on materials explored within the course) activities that practice and reinforce basic arithmetic skills.
- Identify common arithmetic errors/misconceptions. Articulate preventative measures that teachers may take as well as responsive guidance that might be given to learners.

Within algebraic concepts and skills:

- Articulate the definitions of and relationships between common sets of numbers: whole, integers, rationals, and reals.
- Demonstrate knowledge of field axioms and identify axioms used in context.
- Give a correct, clear, complete explanation of why one cannot divide by zero.
- Articulate the distinction between the following concepts: minus, opposite, and negative.
- Recognize and describe the progression of algebraic reasoning in the Pre-K-8 mathematics curriculum.
- Distinguish between an unknown and a variable, and between an equation and an expression; explain the significance of each of these.

Students <u>must pass</u> a **Math 602 – Basic Skills Gateway** in order to pass the course. The gateway consist of 20 basic skills problems (+, –, ξ,÷,% with fractions and decimals); students will have 20 minutes to complete the exam and will not be permitted to use a calculator. Passing requires 18 or more correct answers. The Math 602 – Basic Skills Gateway may be taken up to five times during the semester.

Approved: April 2014
Edited: November 2014 (Professional Exam Prerequisite updated to Core I)