

**Towson University**  
**Math 321.XXX (3 credits)**  
**Teaching Mathematics in Elementary School**

*The mission of teacher preparation at Towson University is to inspire, educate, and prepare facilitators of active learning for diverse and inclusive communities of learners in environments that are technologically advanced.*

Professor: Office: Phone: e-mail: Office Hours:
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**Course Description:** The main objective of Math 321 is to help you acquire the pedagogical knowledge needed for you to become a competent, confident, creative and enthusiastic teacher of mathematics in pre-school through grade 3. Such effective teaching depends on a thorough understanding: of mathematics, of the thinking and learning of students and of pedagogic strategies. You will have opportunities to experience grade appropriate mathematical tasks, guidance in organizing mathematics instruction and introduction to the kind of professional resources that can guide you throughout your teaching career. This course will emphasize teaching for understanding and the kinds of pedagogical strategies that best foster it, a philosophy of teaching and learning espoused by the National Council of Teachers of Mathematics (NCTM).

**Objectives:** Some objectives of this course relate to the teaching/learning of specific mathematical content (NCTM Standard 9-13), but the general objectives are for the pre-service teachers: *[Note: Objectives listed predominantly address NCTM Standard 8: Pedagogy so specific indicators are listed for that standard.]*

1. To build a positive attitude toward mathematics—its teaching and its learning. (NCTM Standard 7);
2. To demonstrate an understanding of what it means for students to construct an understanding of mathematical concepts and procedures appropriate for their age and developmental level (NCTM Indicator 8.3, 8.7, 8.8);
3. To apply child development and learning theories to the teaching and learning of mathematics (NCTM Indicator 8.6)
4. To develop an understanding of reform in mathematics education, especially the Standards developed by the National Council of Teachers of Mathematics, as well as its implications for instruction (NCTM indicator 8.5);
5. To utilize the mathematical processes of reasoning and proof, communication, connections and representation to guide instructional planning and lesson implementation; (NCTM Standards 2-5)
6. To understand the role and importance of problem solving in the development of mathematical understanding of concepts and procedures and also as a goal of the mathematics program (NCTM Standard 1);
7. To use a variety of assessment techniques to provide insight into the thinking of learners and to guide instruction (NCTM Indicator 8.3);
8. To use, evaluate, make and acquire materials and activities that represent and develop an accurate understanding of mathematical ideas (NCTM Indicator 8.1, 8.2, 8.7);

9. To recognize the value and appropriate uses of technology (NCTM Standards 6, 8.7, 8.9);
10. To identify the scope and sequence of topics within contemporary pre-K – 3<sup>rd</sup> grade mathematics instruction from a local, state and national perspective (NCTM Indicator 8.4)
11. To develop a repertoire of strategies for helping all young children learn mathematics meaningfully. (NCTM Indicator 8.1)

### **Required Texts**

Copley, Juanita V. The Young Child and Mathematics. Washington, DC: National Association for the Education of Young Children, 2000.

Smith, Susan Sperry. Early Childhood Mathematics, 3rd ed. Boston: Pearson Education, Inc., 2006.

### Recommended Publications/Journals/Websites:

Teaching Children Mathematics, published by NCTM

NCTM. Principles and Standards for School Mathematics. 2000

[www.nctm.org](http://www.nctm.org)

[www.marylandpublicschools.org/.msde](http://www.marylandpublicschools.org/.msde) (Access to the Voluntary State Curriculum)

[www.marylandmath.org](http://www.marylandmath.org) (Website of Maryland Council of Teachers of Mathematics)

### **Assignments**

*[Note: The list below gives a generic description of minimum assignments. Instructors will explicitly define and describe each, maintaining and including the alignment to the standards.]*

- Planning/teaching/reflecting on 2 mathematics lessons (NCTM Standards 1-6, 8 and 9-13 as appropriate)
- Reading/analyzing/reacting to mathematics education journal articles (NCTM Standards/Indicators depend on topic and 3, 4, 8.5, 8.6)
- Working collaboratively to research/plan/teach classmates about areas of special interest and importance to mathematic educators (NCTM Standards/Indicators depend on topic)
- Planning/using/reflecting on diagnostic interview to assess a child's knowledge of a mathematical topic (NCTM 8.1, 8.3, 8.4)
- Quizzes or Exams (NCTM Standard 8, subsets of standards 1-6, and 9-13)

## Grading Guidelines

**Evaluation:** *[Note: Instructors should provide **specific rubrics/scoring guide** on individual assignments. The following should be included on syllabus as general evaluation guidelines].*

**A range:** exceptional, outstanding work, substantially exceeding qualitative requirements of the assignment.

**B range:** High quality work that reflects an effort to exceed the qualitative requirements of the assignment.

In general, A and B range work reflects extensive, highly thoughtful writing and analysis that is well connected to philosophy of teaching and learning espoused in this course.

**C range:** Work that is satisfactory and meets minimum qualitative and quantitative requirements.

**D range:** Work that does not satisfactorily meet the minimum qualitative and quantitative requirements.

In general, C and D range work reflects low quality of thought; repeating or paraphrasing information; stating random or unsubstantiated facts/concepts with little or no evidence to support ideas.

**Grading:** *[Syllabus must include specific point/percentage structure taking into account all course-required assignments from above]*

**Final Course Grades** depend on your point total as a percent of the possible total.

A: 94–100

A-: 90–93

B+: 87–89

B: 83–86

B-: 80–82

C+: 77–79

C: 70–76

D: 60–69

F: Below 60

**Academic Dishonesty** will result in a grade of 0. (See Towson University Student Academic Integrity Policy)

**Topic Outline:** Although classes are generally organized by mathematical content topics, emphasis will be on pedagogical and assessment approaches which support teaching for understanding. Throughout the semester, the following pedagogic topics will receive particular emphasis:

- Assessing learning
- Solving problems
- Making connections
- Fostering equity
- Using manipulatives
- Using children's literature
- Using technology
- Establishing daily routines

(Note: There is one 3-hour class per week.)

Introduction: standards based learning/teaching	2 classes
Pre-Number concepts, Counting	1.5 classes
Numeration	1 class
Whole number operations Meanings Children's strategies Estimation Mental computation Written computation Basic number combinations	3.5 classes
Geometry, Spatial sense	1 class
Measurement	1 class
Algebraic thinking	1 class
Statistics, Probability	1 class
<u>Fractions</u>	<u>1 class</u>
Total	13 classes

[See Lesson Plan Format.](#)

# **NCATE/NCTM Program Standards (2003)**

## **Programs for Initial Preparation of Mathematics Teachers**

**Process Standards (Standards 1-7)** The process standards are based on the belief that mathematics must be approached as a unified whole. Its concepts, procedures, and intellectual processes are so interrelated that, in a significant sense, its “whole is greater than the sum of the parts.” This approach would best be addressed by involvement of the mathematics content, mathematics education, education, and field experience faculty working together in developing the candidates’ experiences.

Likewise, the response to the disposition standard will require total faculty input. This standard addresses the candidate’s nature and temperament relative to being a mathematician, an instructor, a facilitator of learning, a planner of lessons, a member of a professional community, and a communicator with learners and their families.

### **Standard 1: Knowledge of Mathematical Problem Solving**

Candidates know, understand, and apply the process of mathematical problem solving.

### **Standard 2: Knowledge of Reasoning and Proof**

Candidates reason, construct, and evaluate mathematical arguments and develop an appreciation for mathematical rigor and inquiry.

### **Standard 3: Knowledge of Mathematical Communication**

Candidates communicate their mathematical thinking orally and in writing to peers, faculty, and others.

### **Standard 4: Knowledge of Mathematical Connections**

Candidates recognize, use, and make connections between and among mathematical ideas and in contexts outside mathematics to build mathematical understanding.

### **Standard 5: Knowledge of Mathematical Representation**

Candidates use varied representations of mathematical ideas to support and deepen students’ mathematical understanding.

### **Standard 6: Knowledge of Technology**

Candidates embrace technology as an essential tool for teaching and learning mathematics.

### **Standard 7: Dispositions**

Candidates support a positive disposition toward mathematical processes and mathematical learning.

## **Pedagogy (Standard 8)**

In addition to knowing students as learners, mathematics teacher candidates should develop knowledge of and ability to use and evaluate instructional strategies and classroom organizational models, ways to represent mathematical concepts and procedures, instructional materials and resources, ways to promote discourse, and means of assessing student understanding. This section on pedagogy is to address this knowledge and skill.

### **Standard 8: Knowledge of Mathematics Pedagogy**

Candidates possess a deep understanding of how students learn mathematics and of the pedagogical knowledge specific to mathematics teaching and learning.

#### **Indicators**

**8.1** Selects, uses, and determines suitability of the wide variety of available mathematics curricula and teaching materials for all students including those with special needs such as the gifted, challenged and speakers of other languages.

**8.2** Selects and uses appropriate concrete materials for learning mathematics.

**8.3** Uses multiple strategies, including listening to and understanding the ways students think about

mathematics, to assess students' mathematical knowledge.

**8.4** Plans lessons, units and courses that address appropriate learning goals, including those that address local, state, and national mathematics standards and legislative mandates.

**8.5** Participates in professional mathematics organizations and uses their print and on-line resources.

**8.6** Demonstrates knowledge of research results in the teaching and learning of mathematics.

**8.7** Uses knowledge of different types of instructional strategies in planning mathematics lessons.

**8.8** Demonstrates the ability to lead classes in mathematical problem solving and in developing in-depth conceptual understanding, and to help students develop and test generalizations.

**8.9** Develop lessons that use technology's potential for building understanding of mathematical concepts and developing important mathematical ideas.

## **Content (Standards 9-13)**

Candidates' comfort with, and confidence in, their knowledge of mathematics affects both what they teach and how they teach it. Knowing mathematics includes understanding specific concepts and procedures as well as the process of doing mathematics. That knowledge is the subject of the following standards.

### **Standard 9: Knowledge of Number and Operation**

Candidates demonstrate computational proficiency, including a conceptual understanding of numbers, ways of representing number, relationships among number and number systems, and the meanings of operations.

### **Standard 10: Knowledge of Different Perspectives on Algebra**

Candidates emphasize relationships among quantities including functions, ways of representing mathematical relationships, and the analysis of change.

### **Standard 11: Knowledge of Geometries**

Candidates use spatial visualization and geometric modeling to explore and analyze geometric shapes, structures, and their properties.

### **Standard 12: Knowledge of Data Analysis, Statistics, and Probability**

Candidates demonstrate an understanding of concepts and practices related to data analysis, statistics, and probability.

### **Standard 13: Knowledge of Measurement**

Candidates apply and use measurement concepts and tools.

## **Field-Based Experiences (Standard 14)**

The development of mathematics teacher candidates should include opportunities to examine the nature of mathematics, how it should be taught and how students learn mathematics; observe and analyze a range of approaches to mathematics teaching and learning, focusing on the tasks, discourse, environment and assessment; and work with a diverse range of students individually, in small groups, and in large class settings.

### **Standard 14: Field-Based Experiences**

Candidates complete field-based experiences in mathematics classrooms.

#### **Indicators**

14.1 Engage in a sequence of planned opportunities prior to student teaching that includes observing and participating in elementary mathematics classrooms under the supervision of experienced and highly qualified teachers.

14.2 Experience full-time student teaching in elementary-level mathematics that is supervised by an experienced and highly qualified teacher and a university or college supervisor with elementary mathematics teaching experience.

14.3 Demonstrate the ability to increase students' knowledge of mathematics.