

Teaching Mathematics with Technology

Wednesdays 6:30pm-9:00pm Memorial Building: Room 204

Instructor: Dr. Joseph W. Spadano,
Westford Academy Mathematics Department
30 Patten Road, Westford, Massachusetts 01886-2921, 978.692.5570x374 (voice mail),
jspadano@westford.mec.edu

Materials, Required Texts and Memberships: Learning experiences in this course may require students to use a graphing calculator and a variety of mathematics software.

Sixty-seventh Yearbook: Technology-Supported Mathematics Learning Environments.
ISBN 0-87353-569-3; STOCK # 12850C12.
Recommended: Principles and Standards for School Mathematics, NCTM (2000).
ISBN 0-87353-480-8; STOCK # 719C12.
Membership in the National Council of Teachers of Mathematics

Course Description: This course is a formal study of basic and advanced concepts of Mathematics Education using technology. The course of study advances students' knowledge, skills, and behaviors in technology-supported mathematics education. The course is intended to expose students to theoretical frameworks and evaluative schemes used in technology-supported mathematics education, examine factors that influence learning, and actively engage students in mathematical learning experiences. The class will explore the evolution of technology in mathematics education through a variety of learning environments. Evaluative methods for this class will require students to be active agents, central to the learning process. This course is designed to be consistent with the Principles and Standards of the National Council of Teachers of Mathematics.

Learning Outcomes: Students will be able to demonstrate knowledge, skills and behaviors in technology-supported mathematics education by:

developing an understanding of the theoretical relationships between curriculum, pedagogy, and belief systems within a problem solving educational orientation;

developing an understanding of content, process, and evaluative standards in mathematics education using technology;

navigating the technical environment through mathematical learning experiences;

solving and/or designing learning experiences that integrate technology into the mathematics curriculum;

developing an understanding of the natural order of mathematical reasoning and its appearance in technology-supported systems;

using reasoning, communication, connections, and representation in a problem-solving framework to advance mathematical power;

solving and/or creating learning experiences that develop reasoning and logic with an emphasis on instructional technology;
developing an understanding of the role of technology and other instruments related to mathematics curriculum, pedagogy, and evaluation.

Methodology and Course Outline:

Various teaching styles (e.g., direct instruction, guided discovery, independent and cooperative group work, or student presentations) will be used to engage multiple learning styles.

Genuine Assessment and Evaluative techniques will be used in teaching and learning a variety of mathematics content. Evaluative schemes will be embedded within learning experiences.

9.6 Introductions. Curriculum, Pedagogy, and Belief Systems. Educational Orientations and Reasoning.

9.13 Technology's role in the mathematics classroom. Theory into Practice. Advancing Mathematical Power through Process Standards. "Maximizing the Area of a Rectangle" learning experience. Solutions presented by students. Calculus Webquest.

9.20 Theory into Practice. Evaluating process standards. Geometry software through "Predict, Observe, and Explain" model. Pipeline Problem using the Geometer's Sketchpad.

9.27 Discuss readings. Theory into Practice. Exploring content and concepts using Best Grapher software.. Small group learning Family of Curves assignment.

10.4 Discuss readings. The mathematics of change learning experience. Calculus presentation software. Algebra learning experiences using Green Globes.

10.11 . Discuss readings. Theory in Practice. Content Standards using Virtual Manipulatives. Graphing Sinusoidal Curves with Best Grapher.

10.18 Using the Graphing calculator. The Golden Ratio and the Geometer's Sketchpad applet. Open-ended, open-middled, and closed tasks. Graphing Calculator Viewer.

10.25 Discuss readings. Theory into practice. Algebra learning experiences using the Algebra Workbench software.

11.1 Law of Sines and Cosines. Bearings and Surveying learning experiences using magnetic compasses.

11.8 Transformations using the Geometry Inventor. School System software.

11.15 Discuss readings. Theory in Practice. Best Grapher mathematics software. Instructional tasks.

11.22. **(Research Essay) or Webquest due.** Poster Activity. Assessment plans.

12.6 **Mathematics Lessons due.** Summary of lessons.

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This course outline represents an attempt to provide an overview of a semester-long course of study. Modifications to this chronology and topical outline may occur because of temporal constraints and/or upon mutual negotiation provided the intended learning outcomes are not compromised. More detailed descriptions of extended learning experiences, journals, essays, and lesson plans will be provided

Course Requirements and Expectations:

Our goal as a mathematics class is to establish an environment of mutual respect that maximizes learning. Students will demonstrate knowledge, skills and behaviors in mathematics education through a variety of means, which will include spoken and written responses. These will include, but are not limited to, classroom activities, homework, a research essay, journal entries, formal classroom observations, presentations of virtual manipulatives, as well as the design and delivery of a mathematics lesson that incorporates technology or tools.

The nature of this course is interactive. Active involvement includes discussion and mastery of the tasks and learning outcomes related to the purposes, goals, and objectives of this course. Students will examine, critique, and revise their own work as well as the work of others. Absences negatively affect class participation and often impair the quality of student work. Therefore students are expected to be active participants and attend all classes.

(15%)

Homework is assigned regularly and must be done accurately and completely in an organized manner that is mathematically rational and easily readable.

(15%)

A research-based essay or reflection (with an annotated bibliography) that presents contemporary issues surrounding technology-supported mathematics instruction, or a reflection and presentation of a Mathematics Webquest will offer students an opportunity to examine and share relevant information.

(20%)

A journal that contains reflective writings of the problem solving process that incorporates technology-supported mathematics learning experiences will provide students with an opportunity to critically analyze, synthesize, and make objective judgments about Process Standards.

(10%)

Each student will schedule three observations of mathematics lessons that incorporate technology into the learning experience and write a reflection on the process standards and evaluation techniques used during instruction. (20%)

Each student will design and present three mathematical lessons that integrate technology as a component of a complete unit of study. The unit and lesson should include the identification of the intended audience, a list of necessary materials, a purpose statement, learning objectives, teaching methodology, and an evaluative scheme. The learning experience should address multiple learning styles and be consistent with the National Council of Teacher of Mathematics' vision of achieving mathematical power.

(20%)

n.b., Problems are often prevented by communication. If a situation exists or occurs that needs attention, whether personal or academic, please initiate a discussion so that accommodations or solutions can be determined and implemented.