GRED 534 — Fall 2008
Class Time: Mondays 4:30-7:00 p.m.
Classroom: Satterlee 301
E-mail: straigdc@potsdam.edu
Phone: 267-2553 (office)

Instructor: Donald Straight
Office: Satterlee Hall 216A
Office Hours: Mondays 2 – 4:30 p.m.
Tu/Th 11 a.m. – 12 p.m.
or by appointment

GRED 534 Teaching Mathematics in a Technological World

This course will provide students the opportunity to learn how technology and media can be used to enhance students' understanding of mathematics when used appropriately. Students will explore appropriate uses of the calculator, graphing calculator, spreadsheets, and mathematical software packages such as *The Geometer's Sketchpad* and *Fathom*. Students will explore the use of the Internet (WWW) to support middle and secondary mathematics education. The course will review national and state standards on technology and New York State regulations regarding the use of calculators on state examinations. In addition, the course will review other software and multimedia products, and will focus on particular areas of interest to those enrolled.

A fundamental goal of the course is to become familiar with some of the technology tools available and appropriate for enhancing and extending the teaching and learning of middle and secondary school mathematics. Much of our class time will be invested in mathematical explorations using calculators or computers and in discussion of those explorations.

Technology is changing the nature of the mathematics classroom and in some cases the mathematical content taught. Some of the technology we explore and the methods we propose may be new, provoking another goal of the course: to consider the implications of available technology. It has been argued that because of technology, some mathematics may be more accessible to learners, some mathematics may be available for the first time to learners, and some mathematics may become obsolete to learners. Throughout the course, we will consider questions such as these:

- How does technology influence decisions about what mathematics should or should not be taught?
- How does technology impact our teaching?
- How does technology affect our students' learning?
- How do technology-intensive mathematics classrooms differ from the classrooms in which we may have learned mathematics?

Active participation is crucial to the success of the course. We can all expect to share findings, methods, observations and opinions. The course activities are designed with this in mind.

SUNY Potsdam Education Unit Conceptual Framework
A Tradition of Excellence: Preparing Creative and Reflective Practitioners

This course supports the SUNY Potsdam Education Conceptual Framework in several ways. First, through experiences provided in this course students will continue to develop as "Well-Educated Citizens" by modeling the skills, attitudes, and values of inquiry appropriate for a mathematics teacher and by using technology appropriately. Students will continue to develop as "Reflective Practitioners" by modeling inquiry, practice and reflection in their class activities and assignments; effectively using research-based models of curriculum, instruction, and assessment as they plan for instruction; create and teach lessons that incorporate technology appropriately and meet the diverse learning needs of students; identify state learning standards related to their lessons; and develop lessons that promote inquiry, critical thinking, and problem solving. They will develop as "Principled Educators" by demonstrating professional behavior in class; demonstrating appropriate integrity and competence for beginning level pre-service teachers; and showing understanding and comfort with the changing nature of middle/secondary mathematics classrooms.

Course Objectives

Students will:

- Develop familiarity with a number of technology tools for use in the middle and secondary mathematics classroom
- Understand the potential of technology for promoting mathematical exploration, discovery and conjecture
- Become a consumer of research on technology in mathematics education
- Research and share ideas for the use of technology in mathematics instruction
- Evaluate and make informed decisions about the usefulness of computer software and other technologies for the mathematics classroom
- Be able to plan a unit/lesson that incorporates technology in appropriate ways

Text and Materials

Ameis, Jerry, Mathematics on the Internet: A Resource for K-12 Teachers (Third Edition), Pearson/Merrill/Prentice-Hall, 2006.

Lund, Charles and Andersen, Edwin, Graphing Calculator Activities: Exploring Topics in Algebra I &II, Dale Seymour Publications (Pearson Learning Group), 1997.

A web site (www.hubmub.com) will host documents for supplemental reading for the course.

Internet access and email account. *Note: Students should plan to access the Internet on a regular basis.*

Access to a graphing calculator (TI-83+ or TI-84+ preferred).

Evaluation:

Class performance/participation	20%
Assignments	50%
Technology lesson plan/presentation	20%
Reports on technology in mathematics education literature (2)	10%
	100%

Each of the above items is discussed below. Note that there are no exams.

Class Performance

All students are expected to attend and participate in class. You will be evaluated based on your willingness to participate in activities and discussions and your ability to ask questions that represent thoughtful reflection on the material presented and the readings. Good teachers must also be good colleagues. Thus, you will also be assessed on how well you work with others. Are you respectful of the ideas of others? Are you a responsible team member? *Note: You cannot participate if you are not in class.*

Class performance rubric (out of 20 points):

20 Missed no classes. Was always prepared for class. Contributed in a positive manner to class discussions on a regular basis. Enthusiastically participated in class activities. Was respectful of the ideas of others. Encouraged others to participate.

16 Missed no more than one class. Was usually prepared for class. Contributed in a positive manner to class discussions on a regular basis. Enthusiastically participated in class activities. Was respectful of the ideas of others. Encouraged others to participate.

10 Missed no more than two classes. Was usually prepared for class. Made some contribution to class discussions. Participated in class activities. Was respectful of the ideas of others.

0 Missed more than two classes. Was seldom prepared for class. Did not contribute to class discussion or contributions were negative and/or disruptive. Took little or no interest in class activities. Was disrespectful of others.

Conceptual Framework Alignment: professional behavior, works well with others, takes responsibility for one's own actions.

Assignments

Eight to ten assignments will be given during the semester. Assignments will be announced in class and will generally involve applications or extensions of class topics and activities.

Conceptual Framework Alignment: critically analyzes and solves problems, meets the diverse learning needs of all students, demonstrates knowledge of state standards, promotes inquiry, critical thinking and problem solving, effectively uses instructional technology, and effectively uses research-based models of instruction and assessment.

Technology-Based Unit/Lesson Plan

Students will write and present to the class a unit/lesson plan for integrating technology into the mathematics classroom in an appropriate way. Students will demonstrate the ability to develop lessons that meet NYS Learning Standards using technology. It should focus on the ways in which technology can be used to enhance traditional curriculum objectives rather than emphasizing instruction in the use of a particular program or technology. Specific rubrics will be given for lesson plan assignments.

Conceptual Framework Alignment: critically analyzes and solves problems, meets the diverse learning needs of all students, applies knowledge of state standards, promotes inquiry, critical thinking and problem solving, and effectively uses research-based models of instruction and assessment.

Report on Mathematics Education Literature

Each student should report on two articles from the mathematics education literature – one that describes how a given technology can enhance mathematics instruction and one that reports on research related to technology in mathematics education. Typically, these will be from one of the journals discussed in class (e.g., *The Mathematics Teacher*, *Mathematics Teaching in the Middle School*, *Journal for Research in Mathematics Education*, etc.). In a (maximum) two-page report (each), you should give a summary of the article and your personal reaction to the article. If time permits, you may be asked to give a short oral class presentation of your findings. A copy of the article with the report would be helpful but is not required.

GRED 534 – Teaching Mathematics in a Technological World – Fall 2008 – Course Outline*

Readings and other assignments are due at the beginning of class on the dates indicated unless directed otherwise.

Month	Week of	Topic/Activity*	Readings	Assignments
Aug	25	Introduction to the course Review course syllabus Why use technology in the mathematics class? Multiple representations What do the standards say about technology? –NCTM Standards (Technology Principle) –NY State MST Learning Standards –ISTE Standards	Online documents	• Background survey (in class)
Sept	1	No class – Labor Day		
	8	Creating Mathematics documents (e.g., *MathType*) Using Microsoft Word effectively Adobe Portable Document Format (pdf)	Online documents Class handouts	
	15	*Powerpoint* presentation software Using the Internet/Web to support math instruction	Online documents Ameis book	• Duplicate exam document • Present a WWW math site
	22	Using the Internet/Web to support math instruction Creating Web pages	Ameis book	• Review WWW math sites • Create an internet-based lesson • Create a Web site
	29	Hand calculators NYS regulations on calculator use Graphing Calculators	Online documents Lund book	• Calculator position statement • Calculator activities
Oct	6	Graphing Calculators Collecting real-world data	Lund book	
	13	No class – Fall recess		
	20	Graphing Calculators *Graphing Calculator* software (dynamic)	Lund book	• Graphing Calculator project
	27	Spreadsheets/*Excel*	Online documents Class handouts	
Nov	3	Spreadsheets/*Excel*	Online documents	• Spreadsheet project

			Class handouts	
	10	*The Geometer's Sketchpad* and dynamic geometry	Online documents	
	17	*The Geometer's Sketchpad* and dynamic geometry	Online documents	• *Geometer's Sketchpad* project
	24	*Fathom* and data analysis	Class handouts	
	1	Assistive technology Computer Algebra Systems (e.g., *Maple*) Evaluating computer software Developing a lesson plan that uses technology	Online documents Class handouts	• Software evaluations
Dec	8	Final course topics		• Final homework problem • Review of research articles on technology in math education
	11-17	Finals Week		• Unit/lesson plan • Presentation of unit plan concept

*Approximate Timeframes – Subject to Change

Note: We *may* have guest speakers on selected technology topics. We will often make use of the laptops for a portion of class time to put discussions in practical context as quickly as possible.

Bibliography

Bennet, Dan (1996) Exploring Geometry with *The Geometer's Sketchpad*, Key Curriculum Press.

Brueningsen, Chris (2001) Explorations: Real-World Math with the CBL™ System: Activities for the TI-83 and TI-83 Plus, Texas Instruments.

Burke, Maurice (2001) Navigating Through Algebra in Grades 9-12 (Principles and Standards for School Mathematics Navigations Series), NCTM.

Erickson, Tim (2001) Data in Depth: Exploring Mathematics with *Fathom*, Key Curriculum Press.

Friel, Susan (2001) Navigating Through Algebra in Grades 6-8 (Principles and Standards for School Mathematics Navigations Series), NCTM.

Fey, James (1992) Calculators in Mathematics Education (1992 Yearbook), NCTM.

Heid, M. Kathleen (1995) Algebra in a Technological World (Curriculum and Evaluation Standards for School Mathematics, Addenda Series, Grades 9-12), NCTM.

National Council of Teachers of Mathematics (2000) NCTM Principles and Standards for School Mathematics. Reston, VA: NCTM.

Web Sites

http://www.hubmub.com Mr. Straight's web page efforts, including a page of resources for this semester that will grow as items are added to it.

http://www.nctm.org Home page for the National Council of Teachers of Mathematics.

http://illuminations.nctm.org NCTM Illuminations site – lesson plans, interactive investigations, resources

http://www.nysed.gov Web site for the New York State Education Department.

http://www.nysedregents.org Quick link to access copies of Regents exams and keys.

http://www.nysl.nysed.gov/regentsexams.htm New York State library archives of Regents exams back to the 1940s

http://www.regentsprep.org Web site for great Math A and Math B Regents exam resources.

http://www.lessonplanspage.com One of many lesson plan sites.

http://www.mathforum.com An excellent data base site for mathematics education issues, research, lesson plans, and problem solving.

http://www-groups.dcs.st-and.ac.uk:80/~history This archive developed by St. Andrews University provides the biographies of over 1000 mathematicians.

http://www.c3.lanl.gov/mega-math/index.html This web site develops important mathematics ideas at a level elementary students and teachers can understand.

http://people.clarityconnect.com/webpages/terri/terri.html A math teacher's Web Site with links to great resources

http://education.ti.com Texas Instruments Home Page – information and resources on calculators

http://www.keypress.com Key Curriculum Press – publisher of *The Geometer's Sketchpad* and *Fathom*

http://www2.edc.org/mathproblems/teacher/trHome.asp "Problems with a point" – teacher resources

http://www.mathed.byu.edu/~kleatham/Technology/INDEX.html Resources for Learning to Teach Mathematics with Technology (BYU)

http://www.jmap.org Another well-developed site with assistance for teaching Math A and Math B in NYS.