

GREd 531 – Spring 2009

Class Time: Tuesdays 4:30 – 7:00 p.m.

Classroom: Satterlee 301

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Instructor: Donald Straight

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Office Hours: Tuesdays 2:00 – 4:30 p.m.
or by appointment

GREd 531 Creative Problem Solving – Mathematics

The Graduate Catalog describes that “this course is designed with the goal to provide teachers with the experience of mathematical discovery through creative problem solving. A variety of instructional approaches, including the use of computers, will be examined by solving open-ended problems relevant to school mathematics curriculum.”

It is vital that teachers of mathematics in schools encourage students to think clearly and correctly through exploring, analyzing, and resolving problematic situations, or, in short, to solve problems. This course concentrates on solving a variety of problems relevant to the national and NYS K-12 Standards. The focus is on exploration of various problem solving techniques through solving problems and their extensions, posing new problems, and communicating mathematical demonstrations. As far as high school mathematics content is concerned, the primary ground rule in this course is that problem situations can be investigated with pre-calculus mathematics using a variety of tools, some of which may be technology-related.

Problems that will be considered in the course will come from many sources and contexts, in addition to the required text. In particular, the specific solution strategies discussed will be those outlined in the text: working backwards, finding a pattern, adopting a different point of view, solving a simpler analogous problem, considering extreme cases, visual representation, intelligent guessing and checking, accounting for all possibilities, organizing data, and logical reasoning. Extensions and varying solutions of problems will be explored within these contexts, and will often be presented by students to illustrate individually differing perspectives.

**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 an educator 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 appropriate technology 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 creative problem solving. They will develop as “Principled Educators” by demonstrating professional behavior in class; demonstrating appropriate integrity and competence for practicing teachers; and showing understanding and comfort with the changing nature of twenty-first century classrooms.

Course Objectives

Students will:

- Develop familiarity with a number of problem solving strategies for use in the mathematics classroom and beyond
- Understand the potential of technology for promoting mathematical exploration, discovery and conjecture
- Become a consumer of research on effective mathematics education
- Research and share ideas relating to problem solving in mathematics instruction
- Evaluate and make informed decisions about the use of various approaches for teaching problem solving in the mathematics classroom
- Be able to plan a unit/lesson that incorporates problem solving with the goal of enhancing the students’ abilities to solve mathematical problems and extend those abilities in an interdisciplinary way

Required Text

Posamentier, Alfred S. and Krulik, Stephen, Problem-Solving Strategies for Efficient and Elegant Solutions, Corwin Press, 1998.

Recommended Materials and Other Resources

Polya, George, How To Solve It, second edition, Princeton University Press.

National Council of Teachers of Mathematics, *Principles and Standards for School Mathematics*, 2000. (120-day free access at <http://standards.nctm.org>)

The New York State Education Department, www.nysed.gov

Course Evaluation

Class performance/participation	20%
Written assignments/“exams”	40%
Problems of the week	10%
Class presentations	10%
Final problem-solving project	<u>20%</u>
	100%

Each of the above items is discussed below.

Class Performance and Participation

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/participation 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/"Exams"

Regular assignments will be given during the semester. These assignments will vary in focus; some will involve actually solving problems using techniques discussed in class, and others will require discussion or analysis of problem solutions that are already provided. Additionally, a solved problem may request that an alternate solution be completed, with a subsequent comparison. There will also be two "exams" given throughout the semester. The nature of these exams will be determined by the focus of the preceding class sessions, and further detail will be provided for each; they will be planned to take less than the allowed class time, perhaps between one and two hours. This combination of assignments and exams will count as 40% of the course grade.

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.

Problems of the Week

Each week, a problem will be given that will test students' abilities to think and solve problems "creatively." It will be due for submission the following week, and collectively these problems will constitute 10% of the course grade. Credit will be granted based on method(s), correctness, and completeness of solution.

Class Presentations

After the first class, students will present in each class session. Every student is expected to present approximately an equal number of times, and volunteering is encouraged. These presentations will vary in emphasis – some will be more to model a particular problem-solving approach, and may contain examples of problem solutions, while others may be just to show a derived solution of a particular problem. These presentations, cumulatively, will determine 10% of the course grade.

Final Problem-Solving Project

There is no final exam for this course – your final project will be to create a significant educational product to focus on problem-solving within your own classroom. This may be a unit plan that teaches problem-solving skills in the context of mathematics, a learning center that will be used in your classroom to assist students as they develop problem-solving skills, a collection of problem-solving activities that will be incorporated at various points through a school year in your classroom, or another product idea that you discuss with me and of which I approve. You will present an overview of this product (~20 minutes) to the class during the final class meeting date. This project and the accompanying presentation will constitute 20% of your grade for the course.

Class Sessions

Each class session will provide opportunities to solve problems, to present solutions or approaches, to engage with others, and to improve internalization of various mathematical problem solving approaches to more effectively model them in your subsequent instruction and daily life.

Class dates are as follows (Mondays from 4:30 – 7:00 p.m.):

January 19, 2009

January 26, 2009

February 2, 2009

February 9, 2009

February 23, 2009

March 2, 2009 – first “exam” during class time

March 9, 2009

March 16, 2009

March 30, 2009

April 6, 2009

April 13, 2009

April 20, 2009 – second “exam” during class time

April 27, 2009

May 4, 2009

May 11, 2009 – Final Lesson Presentations (final exam week)

Beginning with the January 26, 2009 class, student presentations will be part of each class session.