MATH 5321: Problem Solving and Mathematical Reasoning for Teachers

Course Syllabus for Math 5321.001, Fall 2012, CRN: 73321

I. COURSE INFORMATION

Instructor: Joe Champion, Ph.D.
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Webpage: http://faculty.tamucc.edu/jchampion
Office location: Center for Instruction #359
Office phone: 361-825-3165
Office hours: TBD; also by appointment
Meeting place: Center for Sciences Room 107
Meeting times: Mondays, 7-9:30 p.m., August 27th to December 10th

II. COURSE DESCRIPTION

This course provides an advanced perspective on teaching and learning secondary mathematics through problem solving, reasoning, and communication.

Math 5321 (Catalog Description): An investigation of problems that span a variety of domains with a focus on making and evaluating mathematical arguments, using tools such as manipulatives and technology, identifying and analyzing the connections within and outside of mathematics, and using symbols and representations to communicate mathematical ideas.

Note: This section is specially designed to leverage connections to high school mathematics.

III. PREREQUISITES for the COURSE

Graduate standing; teacher certification or secondary math teaching experience; and/or permission of the program coordinator.

IV. REQUIRED TEXTBOOKS and OTHER MATERIALS

- Discovering Mathematics: The Art of Investigation, by A. Gardiner, Dover Publications
- A graphing calculator
- Regular access to high speed internet and office applications (e.g., MS Word, Excel)

V. STUDENT LEARNING OUTCOMES

Upon successful completion of the course, class participants will:

- **Solve Problems.** Improve skills for engaging in productive mathematical problem solving using secondary mathematics content.
- **Work with Others.** Demonstrate effective small-group collaboration and cooperation skills through problem solving scenarios with peers.
- **Communicate Math.** Use the formal and informal mathematics register describe problem solving processes and solutions in written, oral, and visual modalities.
- **Design Problems.** Effectively create and implement problem solving tasks in a secondary mathematics setting.
- **Use the Literature.** Independently research and synthesize information about a family of problem solving tasks for applications in a teaching setting.
VI. INSTRUCTIONAL METHODS and ACTIVITIES

The course will be a combination of instructional presentation of new material and concepts, whole-class discussion, individual investigations of mathematics, and optional one-on-one discussion time between students and the instructor outside of class. Students may be required to give individual or group presentations. All participants are expected to actively engage in all class activities by contributing ideas and thoughtfully evaluating others’ contributions.

VII. MAJOR COURSE REQUIREMENTS and ASSESSMENTS

Final course grades will be a weighted average of mean scores using the following weights:

- Classwork: 20%
- Projects: 30%
- Homework: 30%
- Final Exam: 30%

Final weighted grades exceeding 90% will result in a letter grade of A. Those exceeding 80% will result in at least a B; ≥ 70% will result in at least a C; ≥ 60% will result in at least a D; below 60% will result in an F.

**Classwork** – participate in inquiry tasks, whole-class discussion, and both collaborative and cooperative group work activities during regularly scheduled class time.

**Projects** – First, choose and research a class of problem solving tasks with connections to secondary mathematics. Then, write a report on your exploration and deliver an engaging presentation on your family of problems to your peers. See the project guidelines for details.

**Homework** – demonstrate improving problem solving skills through weekly problem sets, readings, and writing prompts. Collaboration is great, but only submit your own original work.

**Final Exam** – complete a comprehensive summative evaluation of course knowledge through a pre-test / post-test design measured through normalized gains. The final exam cannot be made-up if missed. If you have a conflict with the scheduled final exam time, please contact me at least one week prior to discuss scheduling options.

**»** The final exam is scheduled for **Monday, December 10th, 7:15-9:45 p.m.**

VIII. COURSE OUTLINE (subject to change, see the course site for updated schedule)

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<thead>
<tr>
<th>Date</th>
<th>TOPIC</th>
<th>CONTENT</th>
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<tbody>
<tr>
<td>8/27</td>
<td>Introductions</td>
<td>Introductions; Problem Solving Pre-test</td>
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No Class on Sept. 3rd – Labor Day Holiday

<table>
<thead>
<tr>
<th>9/10</th>
<th>Historical perspectives</th>
<th>Toward an understanding of ‘mathematical thinking’: historical perspectives of PS in mathematics</th>
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<tbody>
<tr>
<td>9/17</td>
<td>Teaching PS</td>
<td>Problem Scenarios; PS approach to teaching, NCTM PS standard</td>
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### Date | TOPIC | CONTENT
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9/24 | Strategies | Problem Scenarios; developing understanding through PS, mathematical habits of mind; PS strategies (heuristics)
10/1 | Communities of Inquiry | Problem Scenarios; teacher’s role in teaching mathematics through PS; fostering communities of inquiry
10/8 | Technology | Problem Scenarios; using technology to foster mathematical meaning through PS
10/15 | Balance | Problem Scenarios; balancing PS and symbolic manipulation skills
10/22 | PS Tasks | Problem Scenarios; selecting quality tasks for problem-based teaching; problems vs. problem solving, conflicting definitions
10/29 | Problem Posing | Problem Scenarios; problem posing as a tool for teaching mathematics
11/5 | Socio-mathematical norms | Problem Scenarios; social and socio-mathematical norms in the mathematics classroom; discourse and PS
11/12 | Other countries | Problem Scenarios; mathematical PS in other countries
11/19 | Assessment | Problem Scenarios; classroom assessment issues related to PS
11/26 | Presentations | Teacher Project Presentations
12/3 | Presentations | Teacher Project Presentations
12/10 | Final | Post-test

### IX. CLASS POLICIES

**Attendance/Tardiness.** Since this course meets just once a week, you’re expected to attend every class session, arrive on time, and complete all in-class activities. If you need to miss part or all of a class session, please talk with a classmate and see the course website to get caught-up. Feel free to email me if you have questions.

**Late Homework.** Homework will usually be due the next class, but may be submitted later if you request an extension prior to the deadline. The instructor may enforce strict deadlines on some assignments (e.g., projects) by announcing a “hard deadline.” Any partial credit earned for assignments submitted after hard deadlines will be assigned at the instructor’s discretion.

**Cell Phones/Electronic Devices.** Please silence electronic devices during class and step out of class to use them. You may not use any personal electronic device during exams.

**Written Work.** Good writing skills are important in this class. Please type and proof-read your written assignments. The Writing Center is available for help with written assignments.
In-Class Discussion. Everyone in the class is encouraged to express personal views with an emphasis on evidence-based claims. We have diverse backgrounds and perspectives, but by maintaining a spirit of mutual respect and acknowledgement, the hope is that classroom discussion will be inviting, lively, and informative.

Dropping a class. I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with me before you decide to drop to be sure it is the best thing to do. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance & participation WILL NOT automatically result in your being dropped from the class.

Academic integrity. University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a minimum of a 0 on the assignment or test.

Disabilities Accommodations. The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in Corpus Christi Hall, Room 116.

Veterans. If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

Grade appeals process. As stated in University Rule 13.02.99.C2, Student Grade Appeals, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Rule 13.02.99.C2, Student Grade Appeals, and University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules Web site at tamucc.edu/provost/university_rules. For assistance and/or guidance in the grade appeal process, students may contact the Office of Student Affairs.

Classroom Behavior. Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.
Changes. The instructor may amend the syllabus at any time prior to the final exam by announcing the changes in class.