University of Texas at El Paso
College of Education
Department of Teacher Education
MTED 5322 (14385) "Pedagogy and Content Knowledge in Teaching Mathematics: Fostering Quantitative Reasoning"
Fall 2010

Class meeting time: R 5:30 p.m. – 8:20 p.m.
Class meeting place: College of Education, EDUC 402

Professor: Dr. David Carrejo
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E-mail: dcarrejo@utep.edu (best means of contact)
Office Hours: M 3 – 4:30, T 2 – 4:30, R 3:00 – 4:30, or by appointment

This syllabus is subject to change as needed. Any changes to the syllabus will be announced in class.

No cellular phones or beepers are permitted in class.
If you have or suspect a disability and need accommodations you should contact Disabled Student Services (DSSO) at 747- 5148 or at dss@utep.edu or come by Room 106 Union East Building.

Required Texts

- Burrill, G.F., & Elliott, P.C. (Eds.) (2006). *Thinking and Reasoning with Data and Chance.* National Council of Teachers of Mathematics: Reston, VA.

- Lehrer, R., & Schauble, L. (2002). *Investigating Real Data in the Classroom: Expanding Children's Understanding of Math and Science.* Teacher's College Press: New York, NY.

- Other necessary handouts and/or readings will be passed out in class. ***OTHER COURSE HANDOUTS (such as activity masters) WILL BE MADE AVAILABLE ON BLACKBOARD (through my.utep.edu) You MUST have a valid UTEP login and password to access my.utep.edu, BLACKBOARD, and many other relevant UTEP websites.*** A UTEP e-mail address is required for all e-correspondence and more effective communication.

Policy on Academic Dishonesty

The University of Texas at El Paso prides itself on its standards of academic excellence. In all matters of intellectual pursuit, UTEP faculty and students must strive to achieve based on the quality of work produced by their individual. In the classroom and in all other academic activities, students are expected to uphold the highest standards of academic integrity. Any form of scholastic dishonesty is an affront to the pursuit of knowledge and jeopardizes the quality of the degree awarded to all graduates of UTEP. It is imperative, therefore, that all faculty, insist on adherence to these standards.

Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are not attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. Proven violations of the detailed regulations, as printed in the Handbook of Operating Procedures (HOP) and available in the Office of

the Dean of Students, may result in sanctions ranging from disciplinary probation, to failing grades on the work in question, to failing grades in the course, to suspension or dismissal among others.

Course Objectives

Students enrolled in this course are offered a research-based and multi-faceted look at issues regarding the development and enrichment of quantitative reasoning across K-12 classrooms and its importance in developing mathematical literacy. The course will focus on developing quantitative reasoning through several domains of mathematics -- numeracy, probability, and statistics. Another key objective of the course is for UTEP students to understand and appreciate how quantitative reasoning is also integrated into other mathematics domains such as discrete mathematics and algebra.

Based on scholarly work, the course is organized around three major themes: 1) the nature of quantitative reasoning (including historical perspectives), 2) a constructivist-based analysis of math students' quantitative reasoning and learning, which forms the basis of sound pedagogical practice for developing quantitative reasoning, and 3) the role of mathematical modeling (including technology) in fostering quantitative reasoning, beginning with math students' investigating real data in the classroom.

Our driving questions include:

- **What are the most powerful concepts, ideas, and methods (including mathematical modeling techniques) related to quantitative reasoning that are accessible to learners?**

  To try and answer this question about learning, you will be reading and analyzing relevant literature (book chapters). It is imperative that we understand what has been researched and what methods of research have been used regarding quantitative reasoning.

- **How can we link theory and practice in the teaching and learning of quantitative reasoning across the K-12 mathematics curricula?**

  We will explore **pedagogical content ideas and methods** when teaching key topics related to quantitative reasoning. Our understanding of these ideas and methods will be relevant for several grade levels in K-12.

We will also reflect upon our own experiences and beliefs about mathematics. We will look at mathematics as a discipline, and, based on the presented research literature, compare more traditional ideas about what it means to 'know' and 'do' mathematics to the vision of mathematics advocated by the reform movements (including its relevancy and applicability in society) as well as what it means to 'know' and 'do' mathematics relying on constructivist principles on learning and teaching.

TExES integration and SBEC standards

- Course objectives primarily reflect TExES standards and SBEC standards for educator certification.
  - TExES website: http://www.texes.ets.org/texes/
  - SBEC website: http://www.sbec.state.tx.us/SBECOnline/default.asp

- TExES Math Content and Pedagogy and Professional Responsibilities (PPR) Preparation Manuals: http://www.texes.ets.org/texes/prepMaterials/

Texas Math Standards and National Standards

- All TEKS, Texas Essential Knowledge and Skills, for all grades and subjects can be found at this website: www.tea.state.tx.us/teks/#Grade

- National Council of Teachers of Mathematics (2000). *Principals and Standards for School Mathematics*: http://standards.nctm.org/

- Curriculum Focal Points: http://www.nctm.org/focalpoints.aspx

English Language Proficiency Standards

This course integrates English Language Proficiency Standards for English Language Learners (ELLs) in order to provide strategies for language acquisition and academic success in all content areas for students at different levels (beginning, intermediate, advanced, and advanced high) in the domains of listening, speaking, reading and writing.

- ELP Standards: http://www.tea.state.tx.us/curriculum/biling/elps.html

Course Requirements

- It is expected that students will attend **all classes** and actively participate in working on projects and class discussions. Students are expected to prepare for each class session. **Lateness to class is strongly discouraged. With the emphasis on collegiality it is important that all group members be in class to contribute to the group's effort in developing an understanding of what it means to teach mathematics effectively**.
- Assignments are due on the specified dates. **Late assignments will not be accepted**.
- The schedule of topics and reading assignments may change over the course of the semester. **Any changes to the syllabus will be announced in class. Every student is responsible for these changes whether or not the student is present in class.**
- **Type or word-process all assignments**. All assignments should be double spaced with a 12 point font. Number your pages, preferably using a header or footer. Correct grammar and spelling are expected. Further guidelines for the final project will be provided in class.

Attendance Policy

There will be a student sign-in sheet at the beginning of each class. If a student misses a session, it is the responsibility **of the student** for knowing and completing all work required. **Each attendance will count towards the final grade. Two tardies (including early leaves) will count as one absence. More than two absences may result in a student earning one-letter grade lower in the course.**

Course Assignments

1. *Presentations on Required Readings*

   Working in pairs, students will be required to create a brief presentation for the articles, papers, or chapter(s) you are assigned (either overhead transparencies or PowerPoint) for a given week. Each pair of students will present/lead the discussion per week. Each presentation should highlight key points in the reading(s) and you are expected to generate discussion questions for the class. You are highly encouraged to guide the class through a mathematical activity closely related to the reading. Guidelines

for presentations and presentation rubric will be provided in class. All presentation materials will be turned in so they can be made available to the class.

2. *Homework (problem-based activities)*

   During this semester, you will participate, as part of this course, in several inquiry-based activities. Students will be assigned homework related to the inquiry-based assignments and these will be collected. The homework assignments and due dates will be announced in class; typically, the homework will be due the following class day.

3. *Final Project*

   In lieu of a final exam, each student, working alone or in pairs (no more than two students per group) will be responsible for a final project (designing a problem/lesson) and mini-research paper on a topic from quantitative reasoning. It may focus on a topic we have covered in class, but in-depth, or it may focus on a topic not covered in class. These will be handed in at the end of the semester.

   The choice of topic is up to you, but final approval will be given by me. You should choose something significant to learning and teaching quantitative reasoning. The project must involve either a technology (computer) component or a "hands-on" component. You will be responsible for writing a minimum 5 page mini-research paper supporting your topic (i.e. a mini-review that justifies why you believe the problem/lesson you've designed is important). Include an introduction section that gives a statement and the significance of the problem/content. Include a theoretical framework that focuses on student/teacher learning and quantitative reasoning. Further details about the project will be given in class along with continuing guidance from me.

Each student will submit their final project **on December 9**, the final exam day, via e-mail. All materials must be submitted in electronic format on that day before 5:00 p.m. MST.

Grades

In this course all grades are important, but some assignments take more time and thought so therefore some may have a different weight.

- **Class Attendance** 15%
- **Presentations on Readings** 15%
- **Homework assignments** 30%
- **Final Project** 40%

Grade Distribution:	**Grade**	**%**
	A	**93-100**
	B	**85-92**
	C	**75-84**
	D	**65-74**
	F	**0-64**

General calendar – *Topics, assigned readings, and due dates are subject to change.*
(L&S = Lehrer & Schauble book; B&E = Burrill & Elliott book)

DATE	TOPIC	READING FOCUS
August 26	1) Introduction to course 2) Review of syllabus 3) Introduction to WebCT 4) Readings assigned	*L&S: Chapter 1* *B&E: Chapter 4*
September 2	Probability & Chance	*B&E: Chapter 5* *B&E: Chapter 20*
September 9	Probability & Chance Introduction to organizing data	**Student presentations begin** *B&E: Chapter 10*
September 16	Organizing data and "graphing"	*B&E: Chapter 1* *L&S: Chapter 6*
September 23	"Big ideas" in statistics: Classification/Categorization	*B&E: Chapter 3* *L&S: Chapter 9*
September 30	"Big ideas" in statistics: Average	*B&E: Chapter 7* *B&E: Chapter 2*
October 7	"Big ideas" in statistics: Distribution	*L&S: Chapter 4* *B&E: Chapter 9*
October 14	"Big ideas" in statistics: *Variation* *Measurement & Estimation*	*L&S: Chapter 3* **An additional reading will be provided**
October 21	Mathematical Modeling	*B&E: Chapter 21* *B&E: Chapter 22*
October 28	Mathematical Modeling Technology	*B&E: Chapter 12*
November 5	Mathematical Modeling Technology	*B&E: Chapter 16* *B&E: Chapter 17*
November 11	Links to algebra: *Patterns, functions, and arithmetic*	*B&E: Chapter 14*
November 18	Links to algebra: *Patterns, functions, and arithmetic*	*B&E: Chapter 15*
November 25	THANKSGIVING DAY – NO CLASS	
December 2	**Last day of regular classes** Discrete mathematics	**Additional reading(s) will be provided**
December 9	**Final exam day**	***Final projects due***