University of Texas at El Paso
College of Education
Department of Teacher Education
MTED 5320 (27059) "Research Based Practices in the Mathematics Classroom"
Spring 2012

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

Professor: Dr. David Carrejo
Office: College of Education, EDUC 811
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E-mail: dcarrejo@utep.edu (best means of contact)
Office Hours: M 3:00 – 4:30; T 1:00 – 4:00; 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

- Most of the required readings will be available through Academic Search Complete (EBSCO) and electronic journals which are accessible through the UTEP library website. This is a free service for UTEP students. A bibliography of required readings will be provided. Throughout the course, you will also be finding your own articles from selected journals to analyze and critique and present a final paper/proposal.

- OTHER COURSE HANDOUTS (such as activity masters and short readings) 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.

- Additional resources:

    - NCTM Illuminations: http://illuminations.nctm.org/
    - Early Algebra: www.ase.tufts.edu/education/earlyalgebra/default.asp
    - Annenberg Media: http://www.learner.org/index.html
    - National Library of Virtual Manipulatives: http://nlvm.usu.edu/en/nav/vlibrary.html
    - Science NetLinks: http://www.sciencenetlinks.com/

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 will focus on what teachers can learn from current trends in mathematics education research and how to bridge this research with practice in the mathematics classroom. Students will develop a conceptual discourse on current research related to teaching, learning, curriculum, and assessment in school mathematics.

The key objectives of the course are:

1. To study research trends and issues in the teaching and learning of mathematics
2. To identify and discuss problems associated with different research designs
3. To synthesize and re-conceptualize research in mathematics education
4. To describe areas of research most useful to advancing the teaching and learning of mathematics
5. To incorporate areas of mathematics education research into classroom practice

Course Content

Our current topics/research areas will include (but may not be limited to) the following:

- **Quantitative reasoning**
- **Algebra**
- **Proof**

These areas may embed other topics of interest such as learning (cognition), the use of technology, history of mathematics, integrating science with mathematics, ethno-mathematics, assessment, etc.

We will 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 reform movements as well as what it means to 'know' and 'do' mathematics relying on constructivist principles of learning and teaching.

TExES integration and SBEC standards

- Course objectives primarily reflect TExES standards for educator certification.
    - TExES website: http://www.texes.ets.org/texes/
- 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: http://www.tea.state.tx.us/index2.aspx?id=6148
- National Council of Teachers of Mathematics (2000). *Principals and Standards for School Mathematics*: http://standards.nctm.org/
- Curriculum Focal Points: http://www.nctm.org/standards/content.aspx?id=270

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://ritter.tea.state.tx.us/rules/tac/chapter074/ch074a.html#74.4

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. Students are expected to follow APA guidelines.

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 groups of 3 (no more than 3 per group), you 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. One group 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 as well as a mathematical activity for the class. Guidelines for presentations and presentation rubric will be provided. All presentation materials will be turned in to so they can be made available to your peers through Blackboard.

2. *Critical and Reflective Analysis of External Readings*

   At three different times during the course, you will be directed to locate, read, and critique a current and pertinent research article in mathematics education, focusing on the manner in which the studies were designed, carried out, reported, and any quantitative or qualitative analysis that were made. You are expected to become a critical reader in order to properly analyze the qualitative and quantitative research contained in such journals as: Journal of Research in Mathematics Education, Cognition & Instruction, Mathematical Thinking and Learning, Journal of Research in Science Teaching, etc. You are also encouraged to examine international journals. To successfully complete the course, it is important that you become a critical consumer of mathematics education research. Each critique should be 3 – 5 pages (minimum) in length. These external readings should ideally focus on a topic specifically mentioned or covered during the course (quantitative reasoning, algebra, and proof).

3. *Final Position Paper*

   The position paper is approximately 20 double-spaced pages in length (+/– 5 pages). This paper argues how an issue, belief, or perspective has influenced (or is influencing) the content and instructional approach evidenced in mathematics education over time. *For example, you could argue that perspectives about what mathematics students should learn (or what it means to know mathematics) are critical to defining mathematics curriculum. Or you could argue that technology, standardized assessments, public policy, or some research on/theories of teaching and learning have strongly influenced mathematics teaching and learning over time.*

   This paper should offer:

   - A clear definition of the issue, belief, or perspective and an argument as to how or why this position may influence mathematics teaching and learning
   - Specific examples from published mathematics curriculum materials over time that evidence the influence of the identified issue, belief, or perspective on content and/or instructional approach
   - A documented analysis of how and why (or whether) this influence has ebbed and flowed over time, and
   - Recommendations for addressing/using this influence for the benefit of mathematics education.

   The position paper must adhere to APA format and offer a substantive citation of literature to clarify the definition of the position as well as to analyze its impact. **The position paper is due electronically on Monday, May 7, during exam week.**

A final grade for the position paper will consist of an evaluation of the quality of the presentation and the quality of the writing, as well as the use of APA format. Specifically, this assessment will consider the degree to which the paper evidences: (a) a clear presentation of the issue, belief, or perspective; (b) a well-organized and evidenced argument as to the influence of this issue or perspective on mathematics teaching and learning over time (this can include citations from published curriculum or assessment materials); (c) well-founded selection, interpretation and use of published references that adequately support the premise of the paper; (d) integration of background information from course readings and discussion in the analysis; and (e) clarity and feasibility of recommendations, as well as the potential of these recommendations for future positive impact. A rubric will be provided.

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%
- **Critical Analyses** 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.*

DATE	TOPIC	READINGS
	DESIGN RESEARCH	
January 23	1) Introduction to course 2) Review of syllabus 3) Introduction to Blackboard and UTEP library databases	
January 30	1) General overview of educational research methods 2) Focus on design research 3) Presentations assigned	*Reading*: Cobb, et al. (2003)
	QUANTITATIVE REASONING	
February 6	Patterns and pattern-based reasoning	**Chapter Presentations Begin** *Reading:* Papic et al. (2011)
February 13	Data and classification	*Reading:* Lehrer, R., & Schauble, L. (2000).
February 20	Conceptions of 'average'	*Reading*: Mokros, J. & Russel, S.J. (1995)
February 27	Variation and distribution	**First analysis due** *Reading*: Petrosino et al. (2003)
March 5	Probability	*Reading:* Rubel, L.H. (2007)
March 12	*SPRING BREAK – NO CLASS*	
	ALGEBRA	
March 19	Early algebra defined	*Reading:* Carraher, D., Schliemann, A.D., & Brizuela, (2006)
March 26	Equivalence and equations	Alibali, M.W. et al. (2007)
April 2	Function-based reasoning	**Second analysis due** Ellis, A.B. (2011)
April 9	Technology	*Reading:* Maschietto, M., & Bartolini, M.G. (2011)
	PROOF	
April 16	Reasoning and proving	*Reading:* Bieda, K.N. (2010)
April 23	Reasoning and proving	*Reading:* Stylianides, G.J., & Silver, E.A. (2009)
April 30	**Last day of regular classes**	**Third analysis due**

Bibliography of Required Readings

January 30

Cobb, P., Confrey, J., diSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in educational research. *Educational Researcher, 32*(1), 9 – 13.
Available: http://aera.net/uploadedFiles/Journals_and_Publications/Journals/Educational_Researcher/3201/3201_Cobb.pdf

February 6

Papic, M.M., Mulligan, J.T., & Mitchelmore, M.C. (2011). Assessing the development of preschoolers' mathematical patterning. *Journal for Research in Mathematics Education, 42*(3), 237-268. **Available: E-Journals online resource**

February 13

Lehrer, R., & Schauble, L. (2000). Inventing data structures for representational purposes: Elementary grade students' classification models. Mathematical Thinking and Learning, *2*(1&2), 51–74. **Available: E-Journals online resource**

February 20

Mokros, J., & Russel, S.J. (1995). Children's concepts of average and representativeness. *Journal for Research in Mathematics Education, 26*(1), 20 – 39. **Available: E-Journals online resource**

February 27

Petrosino, A., Lehrer, R., & Schauble, L. (2003). Structuring error and experimental variation as distribution in the fourth grade. *Mathematical Thinking and Learning, 5*(2&3), 131-156. **Available: E-Journals online resource**

March 5

Rubel, L.H. (2007). Middle school and high school students' probabilistic reasoning on coin tasks. *Journal for Research in Mathematics Education, 41*(4), 531 – 556. **Available: E-Journals online resource**

March 19

Carraher, D., Schliemann, A.D., & Brizuela, (2006). Arithmetic and algebra in early mathematics education. *Journal for Research in Mathematics Education, 37*(2), 87-115. **Available: E-Journals online resource**

March 26

Alibali, M.W., Knuth, E.J., Hattikudur, S., McNeil, N.M., & Stephens, A.C. (2007). A longitudinal examination of middle school students' understanding of the equal sign and equivalent equations. *Mathematical Thinking and Learning, 9*(3), 221–247.
Available: E-Journals online resource

April 2

Ellis, A.B. (2011). Algebra in the middle school: Developing functional relationships through quantitative reasoning. In J. Cai & E. Knuth (Eds.), *Early Algebraization: A Global Dialogue from Multiple Perspectives* (pp. 215-238). Springer Publications.
Available: Blackboard

April 9

Maschietto, M., & Bartolini, M.G. (2011). Mathematical machines: From history to mathematics classroom. In O. Zaslavsky & P. Sullivan (Eds.), *Constructing Knowledge for Teaching Secondary Mathematics: Tasks to Enhance Prospective and Practicing Teacher Learning* (pp. 227 – 248). Springer Publishing.
Available: Blackboard

April 16

Bieda, K.N. (2010). Enacting proof-related tasks in middle school mathematics: Challenges and opportunities. *Journal for Research in Mathematics Education, 41*(4), 351 – 382. **Available: E-Journals online resource**

April 23

Stylianides, G.J., & Silver, E.A. (2009). Reasoning and proving in school mathematics. The case of pattern identification. In D.A. Stylianou, M.L. Blanton, & E.J. Knuth (Eds.), *Teaching and Learning Proof Across the Grades: A K-16 Perspective* (pp. 235-249). New York, NY: Routledge. **Available: Blackboard**