University of Texas at El Paso
College of Education
Department of Teacher Education
MTED 5318 (18064) Teaching and Learning with Technology in the Mathematics Classroom
Fall 2015

Class meeting time: W 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 608
Phone: 747-5566
E-mail: dcarrejo@utep.edu (best means of contact)
Office Hours: W 3:00 – 5:00 p.m.

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

- *Geogebra: Dynamic Software for Everyone* [v. 5.0]. Available: www.geogebra.org. **This is FREE, open-source software for both Mac and Windows (including tablets).**

- Students are **strongly encouraged (though not required)** to obtain access to: 1) a *licensed version* of Tinker Plots (http://www.tinkerplots.com/), 2) Microsoft Excel, and 3) an internet browser (with updated Adobe Flash Player and Java)

- **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. Some readings will also be available from various online sources. A bibliography of selected readings will be provided.

- 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:

    - National Council of Teachers of Mathematics/Illuminations: http://illuminations.nctm.org/
    - National Library of Virtual Manipulatives: http://nlvm.usu.edu/
    - Science NetLinks: http://www.sciencenetlinks.com/
    - Statistics Education Research Group: http://www.srri.umass.edu/serg

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/focalpoints.aspx

Assessment

- State of Texas Assessments of Academic Readiness (STAAR™) Resources: http://tea.texas.gov/student.assessment/staar/

Technology Standards

- National Educational Technology Standards: http://www.iste.org/AM/Template.cfm?Section=NETS

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 Framework

Students enrolled in this course will be exposed to different theories about using technology (in various forms) to teach mathematics. Basing their ideas on research and practitioner literature as well as theories of learning mathematics, students will participate in discourse on the use of technology in the mathematics classroom. Students will determine appropriate roles for technology in teaching key concepts within specified mathematical domains (e.g. algebra, geometry, and statistics) through their own inquiry-based experiences.

The key objectives of the course are:

1. To study current research trends and issues in the use of technology for teaching and learning of mathematics
2. To become familiar with and adept at using various types of interactive software and devices (e.g. graphing calculators, Geogebra, TinkerPlots)
3. To identify and discuss problems associated with the use of technology for teaching and learning mathematics
4. To incorporate technology, including web-based resources and open source materials, into classroom practice (i.e. curriculum planning and lesson planning)
5. To define areas of technology education research most applicable to advancing the teaching and learning of mathematics

Course Content and Objectives

Our content areas (domains) will include (but may not be limited to) the following:

- **Geometry**
- **Algebra**
- **Quantitative reasoning (Probabilistic & Statistical reasoning)**

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, reflect on what it means to 'know' and 'do' mathematics relying on constructivist principles of learning and teaching and how the use of technology impacts learning and teaching. We will be examining and using various forms of technology that include (but may not be limited to) the following:

- **GeoGebra**
- **TI Graphing Calculator/TI Nspire** (https://education.ti.com/en/us/downloads-and-activities)
- **SimCalc MathWorlds** (http://www.kaputcenter.umassd.edu/products/software/)
- **Tinker Plots** (http://www.tinkerplots.com/)
- **Microsoft Excel**
- **NetLogo and various Java-based applets** (https://ccl.northwestern.edu/netlogo/)

Upon completion of the course, students will be better prepared to:

- Identify what makes a 'good mathematical task', and how can a good task support students' learning
- Understand how children make sense of key mathematical concepts using technology)
- Understand how technology assists children in their thinking and problem solving
- Identify their role as teacher in a math classroom utilizing technology
- Design mathematics lessons based upon constructivist principles of learning and teaching and utilizing technology
- Design instruction based on what they learn from their students' use of technology

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. *Reflection papers/Blackboard postings*

   You will be asked to synthesize what you are reading and integrate it with discussions held in class. At several points throughout the semester (see calendar), you will be asked to prepare a short (1-2 page) written reflection on an essay question that I will post on Blackboard. The question will focus on the readings and on a topic or topics discussed in class.

2. *Homework problems*

   Students will be assigned problems related to the inquiry-based activities presented in class. The assigned problems and due dates will be announced in class. A tentative schedule is presented in the calendar. Typically, the homework will be due the following class day but some problems may take longer. These problems will address conceptual understanding of the mathematical topic or construct. Furthermore, they will assess your understanding about modifying a problem or activity using technology.

3. *Final Project*

   Part I: Lesson Plans
   I require that you construct a sequence of lessons (**minimum of two**) in one of the mathematical domains that we have studied (algebra, geometry, or quantitative reasoning). Topics will receive final approval from me. The completed sequence **must involve** a technology (computer or calculator) component and must utilize either a graphing calculator and/or one of the interactive pieces of software we have studied in class. A lesson plan guide and a unit guide will be provided in class.

   Part II: Thought Paper
   You will be responsible for writing a **minimum 10 page** "white" paper supporting your lesson design (i.e. a paper that justifies why you believe the lessons you've designed are important and how they are based on a sound understanding of constructivist-based teaching and the use of technology). Include an introduction section that introduces the content and the significance of the learning trajectory (i.e. why it is important for students to learn this topic or topics and why they should learn it the way you've designed your lessons using technology). Include a theoretical framework that focuses on student/teacher learning for your given topic (**a minimum of 3 solid references** from peer-reviewed journals or edited books).

Further details about the project will be given in class along with continuing guidance from me. You will submit your project electronically **on Wednesday, December 9,** by 12:00 midnight, MST, the final exam day. All materials related to the final project **must be** submitted on that day.

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%
- **Blackboard postings** 15%
- **Homework** 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 / ASSIGNMENTS
	GEOMETRY	
August 26	• Introduction to course • Introduction to Blackboard and UTEP library databases • Investigating technology in the mathematics classroom	
September 2	• Conceptual foundations – Logic; Van Hiele Levels	*Reading:* Dindyal et al. (2007)
September 9	• Conceptual foundations – Classification; properties of shapes; spatial reasoning; geometric constructions	*Reading:* Goldenberg & Cuoco (1998)
September 16	• GeoGebra – Tiling and symmetry	**Blackboard Post 1 due**
September 23	• GeoGebra – Similarity and proportionality	**Homework 1 due**
September 30	• GeoGebra - Models and modeling	*Reading:* Bu et al. (2011)
	ALGEBRA	
October 7	• Conceptual foundations – Early Algebra and Function-based reasoning	**Homework 2 due** *Reading:* Papic et al. (2011)
October 14	• Microsoft Excel – Patterns and variable; sequences; constructing equations	*Reading:* Lagrange & Erdogan (2009)
October 21	• Graphing Calculator & GeoGebra– The Coordinate Plane; solving equations	**Blackboard Post 2 due**
October 28	• SimCalc (Java Math Worlds) & NetLogo – Simulations and multiple representations	**Homework 3 due**
November 4	• GeoGebra – Analytic geometry	*Reading:* Dennis (1997)
	STATISTICS	
November 11	• Conceptual foundations – representing data; distribution and variation	**Homework 4 due** *Reading:* Konold et al. (2007)
November 18	• GeoGebra - Statistics • Tinker Plots – "Plotting" data; scatter plots	*Reading:* Watson, J. & Donne, J. (2009) **Blackboard Post 3 due**
December 2 **Last day of class**	• Tinker Plots – Histograms, distributions	**Homework 5 due**

Bibliography

- *September 2*

Dindyal, J. (2007). The need for an inclusive framework for students' thinking in school geometry. *The Montana Mathematics Enthusiast*, 4*(1),* 73 – 83 **Available online**: http://www.math.umt.edu/tmme/vol4no1/

- *September 9*

Goldenberg, E. P. & Cuoco, A. A. (1998). What is Dynamic Geometry? In R. Lehrer & D. Chazan (Eds.) *Designing Learning Environments for Developing Understanding of Geometry and Space*. Mahwah, NJ: Lawrence Erlbaum Associates, 351-368. **Available: Blackboard**

- *September 30*

Bu, L., Spector, J.M., & Haciomeroglu, E.S. (2011). Toward model-centered mathematics learning and instruction using GeoGebra: A theoretical framework for learning mathematics with understanding. In L. Bu & R. Schoen (Eds.), *Model-centered learning: Pathways to mathematical understanding using GeoGebra* (pp. 13 – 40). Rotterdam, The Netherlands: Sense Publishers. **Available: Blackboard**

- *October 7*

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 Database, access through UTEP Library web page**

- *October 14*

Lagrange, J-B., & Erdogan, E.O. (2009). Teachers' emergent goals in spreadsheet-based lessons: Analysing the complexity of technology integration. *Educational Studies in Mathematics, 71,* 65 – 84. **Available: E-Journals Database, access through UTEP Library web page**

- *November 4*

Dennis, D. (1997) Rene Descartes' curve-drawing devices: Experiments in the relations between mechanical motion and symbolic language. *Mathematics Magazine, 70*(3), 163-174. **Available online:** http://www.quadrivium.info/MathHistoryIndex.html

- *November 11*

Konold, C., Harradine, A., & Kazak, S. (2007). Understanding distributions by modeling them. *International Journal of Computers for Mathematical Learning(12)*, 217 - 230. **Available: E-Journals Database, access through UTEP Library web page**

- *November 18*

Watson, J. & Donne, J. (2009). TinkerPlots as a research tool to explore student understanding. *Technology Innovations in Statistics Education, 3*(1). **Available online:** http://www.chartwellyorke.com/tinkerplots/TinkerPlots_TISE_March2009.pdf