



TEACHER EDUCATION DEPARTMENT COLLEGE OF EDUCATION UNIVERSITY OF TEXAS AT EL PASO

*“...the mindset held by teachers open or close pathways for students...” ~Jo Boaler*

MTED5322 (13403)

ONLINE

Pedagogical Content Knowledge in Teaching Mathematics

Fall 2023

Course Description: Course topics include (but are not limited to) the following main content domains of school mathematics and their effective teaching and learning: Development of Quantitative Reasoning; Fostering Algebraic Thinking; Conceptual Foundations of Calculus; Development of Geometric Thinking.

This syllabus is subject to change as needed. Any changes to the syllabus will be announced via email or posted on Blackboard. Please note this course is an Online Course with some synchronous sections as needed.

Instructor Contact Information: Ruby Lynch-Arroyo, PhD

Contact/E-mail: rlynych@utep.edu

Office Hours: By email or Virtual on Zoom by appointment.

**Course Philosophy:**

For teachers of mathematics to be truly effective involves bringing together four basic components:

- A. An appreciation of the discipline of mathematics itself.
- B. An understanding of how students learn and construct ideas.
- C. An ability to design and select challenging tasks, create problem-solving environments.
- D. The ability to integrate appropriate, mathematically, and/or scientifically meaningful assessment within the teaching process.

**Learning Outcomes:**

On completion of this course, students should be able to:

- A. To understand the role of teacher pedagogical content knowledge in learning and teaching of school mathematics
- B. To reflect on the development of students' conceptual understanding and procedural fluency in learning mathematics
- C. To analyze classroom cases and situations with the purpose of improving teaching practices in the mathematics classroom
- D. To learn classroom techniques to make connections between students' ideas, between student and teacher ideas, between different mathematical ideas, domains, and representations.

This course has been constructed to help you in critically examining the philosophies, theories, research, pedagogical techniques, and materials associated with effective learning and teaching.

**Course Goals and Objectives:**

We will address factors that support meaningful growth and progress on an inner journey towards personal transformation. Our classroom community will develop a process that will allow us to explore “who we are,



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what assumptions we hold as true, how and what we teach, how we organize ourselves, and what barriers prevent us from creating authentic learning environments” (Crowell, Caine & Caine, 1998).

Students enrolled in this course will explore the methods of teaching mathematics. Emphasis is placed on the equity principle (learning for all) and development of conceptual understanding of topics, as well as project/problem/inquiry-based learning.

Exploring innovative learning theories and techniques of teaching and learning including problem-based and inquiry, open-ended approach.

### **MTED5322 Required Text:**

*Mathematical Mindsets: Unleashing Students’ Potential Through Creative Mathematics, Inspiring Messages, and Innovative Teaching*. Boaler, J. (2022) Second Edition. ISBN: 9781119823063.

Additional Resource: <https://www.youcubed.org/>

Additional Bibliography could be found in the bibliography sections of the required text.

### **Software Requirements:**

- A. Course materials supplementing the required text will be uploaded on UTEP Blackboard Ultra LMS.
- B. Adobe® Reader® is free software that allows everyone from business professionals to home users to easily and reliably view, print, and search PDF files using a variety of platforms and devices.
- C. Microsoft Office® - This product is available at the UTEP Bookstore.
- D. E-mail tool with file attachment capability. Please use your UTEP e-mail account.

### **Main Course Assignments (Show What You Know and Can Do):**

- A. Readings: each student will read chapters from “*Mathematical Mindsets: Unleashing Students’ Potential Through Creative Mathematics, Inspiring Messages, and Innovative Teaching*” and view related videos and video cases. Use readings and videos as a reference for the reflections, question prompt responses, and discussions.
- B. Discussion Board Participation: each student will submit and respond to ***four (4) required (minimum 150 words each)*** postings in the Discussion board related to class activities (e.g., videos, video cases, readings) based on discussion board prompt.
- C. Reflections/Replies to Prompts on readings, videos, and video cases (APA style, 6-8 pages, double-spaced, 1-inch margins, Times New Roman, font size – 12 pt., Word document): each student will write reflections addressing discussion questions on readings, videos, and video cases.

### **Course Schedule**

Please, look at the course schedule of assignments by clicking on the Modules link on the Blackboard homepage of the course.

***“Talent is a dreadfully cheap commodity, cheaper than table salt. What separates the talented individual from the successful one is a lot of hard work and study.” ~Stephen King.***



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**Module Activities Assignments/ Submissions:**

Module	Topic	Reading	Video (video or link on Blackboard)/Reflection*	Discussion Board**
Module 1 and Intro. & Syllabus Review	The Brain & Mathematics Learning	Chap. 1	"How To Learn Math for Teachers and Parents": Number Talks <a href="https://youtu.be/yXNG6GKFhQM">https://youtu.be/yXNG6GKFhQM</a>	Introductory Video and answer the question: <b><i>What does it take to be successful in mathematics?</i></b>
Module 2	Power of Mistakes & Struggle	Chap. 2	Reflection Questions: The Border Problem Part I and Excerpt of Jo from "The Importance of struggle" <a href="https://www.youcubed.org/resources/excerpt-of-jo-from-the-importance-of-struggle/">https://www.youcubed.org/resources/excerpt-of-jo-from-the-importance-of-struggle/</a>	
Module 3	Mathematical Tasks: Understanding Algebraic Representation	Chap. 5	Reflection Questions: The Border Problem Part II and Cathy Humphreys Teaching a Number Talk <a href="https://www.youcubed.org/resources/cathy-humphreys-teaching-number-talk/">https://www.youcubed.org/resources/cathy-humphreys-teaching-number-talk/</a>	
Module 4	Mathematical Mindsets	Chap. 3	Reflection Questions: Fundamentally Fixing Math(s) Education <a href="https://www.youcubed.org/resources/fundamentally-fixing-maths-education/">https://www.youcubed.org/resources/fundamentally-fixing-maths-education/</a>	
Module 5	Reasonableness, Flexibility with Numbers & Fractions	Chap. 4	Reflection Questions: Division of Fractions	
Module 6	Notion of Proof		Reflection Questions: Notion of Proof	
Module 7	Convincing Others		Reflection Questions: Convincing Others and "Fractions with Sense Making" <a href="https://www.youcubed.org/resources/fractions-sense-making/">https://www.youcubed.org/resources/fractions-sense-making/</a>	
Module 8	Mathematics & Path to Equity	Chap. 6	Through the Eyes of Students	Discussion Board Prompt: What are your beliefs about the following statement: <i>"Homework should be given only if the homework task is worthwhile and draws upon the opportunity for</i>



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				<i>reflection or active investigation around the home”?</i>
Module 9	Extending Prior Knowledge		Reflection Questions: Volume of Prisms & Cylinders	
Module 10	Generating Geometric Formulas		Reflection Questions: Surface Area	
Module 11	Growth Mindset	Chap. 7	[No Reflection] “Jo Teaching a Visual Dot Card Number Talk” <a href="https://www.youcubed.org/resources/jo-teaching-visual-dot-card-number-talk/">https://www.youcubed.org/resources/jo-teaching-visual-dot-card-number-talk/</a>	Discussion Board Prompt: “Which current schooling practices deliver fixed mindset messages to students?”
Module 12	Assessment for Growth Mindset	Chap. 8	[No Reflection] “Beyond Measure   Vicki Abeles   Talks at Google” <a href="https://youtu.be/qcOBI0WH39U">https://youtu.be/qcOBI0WH39U</a>	Discussion Board Prompt: Compare and contrast formative, summative and assessment for learning (A4L); “What roadblocks and solutions can you identify to implementation of any of these approaches to assessment?”
Module 13, 14, 15	Teaching Mathematics for a Growth Mindset	Chap. 9	Final Reflection “Brain Crossing” <a href="https://www.youcubed.org/resources/brain-crossing-video/">https://www.youcubed.org/resources/brain-crossing-video/</a>  “Jodie Sheffels Math failure video” <a href="https://www.youtube.com/watch?v=ybhZyjoUtsg">https://www.youtube.com/watch?v=ybhZyjoUtsg</a>	

*Final Word: I reserve the right to adjust the course syllabus or change assignments as needed.*

*\* Reflections are due **by Sunday at 11:59PM***

*\*\* Required discussion board postings are due **by Saturday at 11:59PM** and peer response **by Sunday at 11:59 pm***



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Assessment of Student Learning Outcomes for Growth Mindset:

Learning Outcome	Achieved by	Measured by
To understand the role of teacher pedagogical content knowledge in learning and teaching of school mathematics	Reading and reflection Participation in discussion boards	Written Reflection Discussion Board Postings
To analyze and reflect upon teaching and learning practices in middle school mathematics classroom.	Reflections on video cases Participation in discussions	Written Reflection Discussion Board Postings
To reflect on the development of students' conceptual understanding and procedural fluency in learning mathematics	Reading and reflection Participation in discussions	Written Reflection Discussion Board Postings
To learn and evaluate classroom techniques that provide connections between students' ideas, between student and teacher ideas, between different mathematical ideas, domains, and representations.	Participation in discussions	Discussion Board Postings

**Grade Distribution:**

Participation/Discussions (each posting - 2 points) 32%  
Reflections on Video Cases (each reflection - 8 points) 64%  
Bonus points 4%

**Grading Scale:**

Students are encouraged to demonstrate their knowledge of content (be content specific!), critical thinking, and communication accuracy while completing course assignments.

89 – 96 = A  
81 – 88 = B  
71 - 80 = C  
61 - 70 = D  
00 - 60 = F

**General Grading Rubric:**

Course assignments will be graded using the following main benchmarks:

- A. Content Specificity: Try to avoid the use of general language, be as math-specific and detailed as possible, please!
- B. Critical Thinking: Do not just describe what you see and read, think critically and analytically, please!



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C. Communication Accuracy: Try to avoid vague description and vocabulary, communicate your ideas clearly and accurately, please!

**Grading Rubrics:**

**Introductory Video Description Rubric:**

- A. Prepare a 2-3-minute video introducing yourself. In the video include 3 things about yourself - 2 that are true and 1 thing that is false. Do not state what is true and what is false.
- B. Post link to the video/or the video on Blackboard
- C. Review your classmates' videos and post which thing you thought was a lie about them.
- D. Respond to answers given by your classmates with the correct answer.

Think about how many inaccurate assumptions were made! Ponder: How can we avoid making assumptions and stereotyping students before we get to really know them?

**Reflections:**

Based on these major benchmarks, the following rubrics will be used to grade your reflections:

**Excellent Work** (8 points + potential bonus point): an exemplary content-specific response with a high level of critical thinking and communication accuracy. Citations to support assertions are included in reflection.

**Good Work** (5 points): a response is partially content specific with a good level of critical thinking and accurate communication. Some citations to support assertions are included in reflection.

**Satisfactory Work** (3 points): low level of content specificity along with descriptive thinking and partially accurate communication. Few citations to support assertions are included in reflection.

**Poor Work** (1 point): a response is too general without specifics and details, communication is poor. No citations to support assertions are included in reflection.

**No Work** (0 point).



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### **Discussion Board Postings:**

There will be four (4) Discussions during the semester. Most of them will focus on the challenging aspects of the major class assignments (e.g., readings, video-cases). Below is the rubric, which will be used to assess the quality of your responses.

<b>Quality of Posting</b>	<b>2.0 points</b>	<b>1.5 points</b>	<b>1.0 points</b>	<b>0.5 points</b>
Completeness	Responds completely to all questions.	Responds to most questions.	Responds to a few of the questions.	Responds to one question or less.
Clarity of Details	Main idea stands out and is supported by detailed and content-specific information.	The main idea is clear but the supporting information is too general.	The main idea is somewhat clear but there is a need for more supporting information.	The main idea is not clear. There is a seemingly random collection of information.
Accuracy	All supportive facts are reported accurately.	Almost all supportive facts are reported accurately.	Few supportive facts are reported accurately.	NO facts are reported OR most are inaccurately reported.
Resources	All resources used for quotes and facts are credible and cited correctly using APA format.	Most resources used for quotes and facts are credible and cited correctly using APA format.	Few resources used for quotes and facts are credible and cited not correctly.	Resources used for quotes and facts are less than credible (suspect) and cited not correctly.
Grammar & Mechanics	The writer makes no errors in grammar or spelling that distracts the reader from the content.	The writer makes 1-2 errors in grammar or spelling that distract the reader from the content.	The writer makes 3-4 errors in grammar or spelling that distract the reader from the content.	The writer makes more than 4 errors in grammar or spelling that distracts the reader from the content.

### **POLICIES:**

#### **A. Class Participation:**

I strongly recommend that you check your Blackboard course at least three times a week at minimum to keep up. Please, do not wait until the last minute to complete and submit your assignments! There might be some technical glitches in the system: try to avoid them. The best way to avoid them is to start your assignments as soon as they are posted. **Late submissions are not allowed!** Since the course is online, it is your responsibility to schedule any emergencies around the course schedule. Not the other way around!

You are welcome to use any resources to successfully complete your assignments. Outside resources should be quoted and a proper reference to the resource should be made. I encourage you to clarify any questions or concerns you may have. E-mail messages are sent to your UTEP email address, so you will want to check your



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UTEP e-mail several times a week. There will be no incomplete grades offered in this course. Past experience has shown that if you cannot complete the course during the time allotted, you probably never will.

### B. Submission of Assignments

Assignments are to be submitted through Blackboard Assignment on the date and time indicated by assignments.

### C. Standards of Academic Integrity

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. 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.

### D. Professionalism

Along with basic standards of citizenship (e.g., “Student Conduct” and “Disruptive Acts Policy” in the UTEP Catalog), students in this course are required to display a positive attitude and professionalism. Be open to using or sharing opportunities for professional growth via Blackboard Discussion Board option. In terms of written assignments, professionalism includes that all assignments be Word processed, checked for spelling/ grammar, and have an appropriate output/ graphics electronically pasted into the document.

### E. Students with Disabilities

If you have or believe you have a disability, you may wish to self-identify. You can do so by providing documentation to the Office of disabled Student Services located in Union E Room 203. Students who have been designated as disabled must reactivate their standing with the Office of Disabled Student Services on a yearly basis. Failure to report to this office will place a student on the inactive list and nullify benefits received. If you have a condition which may affect your ability to exit safely from the premises in an emergency or which may cause an emergency during class, you are encouraged to discuss this in confidence with the instructor and/or the director of Disabled Student Services. You may call 747-5148 for general information about the Americans with Disabilities Act (ADA).

### F. Equal Educational Opportunity

To create equal educational opportunities in the class, all students are expected to demonstrate respect for the diverse voices and individual differences in the class. Particularly, no person shall be excluded from participation in, denied benefits of, or be subject to discrimination under any program or activity sponsored or conducted by the University of Texas at El Paso based on race, color, national origin, religion, sex, age, veteran status, disability, or sexual orientation. Any member of the University community who engages in discrimination or other conduct in violation of University policy is subject to the full range of disciplinary action, up to and including separation from the University. Complaints regarding discrimination should be





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reported to the University's Equal Opportunity Office. Inquiries regarding applicable policies should be addressed to the University's Equal Opportunity Office, Kelly Hall, 3rd Floor, 915.747.5662 or [eoaa@utep.edu](mailto:eoaa@utep.edu)<<mailto:eoaa@utep.edu>>.

### G. Inclusiveness and equity

Learning happens only when we feel respected human being. My top priority in our course is to cultivate relationships of trust and respect and a sense that we see each other as whole, complex human beings. That you experience this in our course is important for the sake of your learning in our course and for the sake of your future students' learning, so that you feel able to cultivate such relationships with them. To that end, I want you to know that all of you is welcome in our learning space—all the parts of you as a person are welcome in our discussions, our activities, our assignments, and in our assessments. We are all complex people with a variety of perspectives, experiences, challenges, assets, and resources—our gender identities, our sexual orientations, our religions, our races, our ethnicities, our economic statuses, our immigration statuses, our parenthoods, our veteran statuses, our ages, our languages, our abilities, and disabilities. All the parts of you are welcome in our learning community to the extent that you feel comfortable bringing them in. I strive to show respect for the variety and wholeness in each of you, and I expect that each of you shows respect for each other as well. If you feel marginalized in our class, and you feel comfortable discussing it, I would like to know so that I can support you, protect you, and make changes that feel more inclusive and equitable. You can also talk with our Department Chair and/or you can report a complaint of discrimination to the University's Equal Opportunity Office, Kelly Hall, Third Floor, 915-747-5662 or [eoaa@utep.edu](mailto:eoaa@utep.edu) .