



Pedagogical Content Knowledge in Teaching Math (Strengthening Quantitative Reasoning)

MTED 5322

CRN 12633

Fall 2025

ONLINE

This syllabus is subject to change as needed. Any changes to the syllabus will be announced via email or posted on Blackboard.

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Office Hours: Virtual on Zoom (by appointment/scheduled in advance) or via Blackboard email; preferred day is Sunday, 7-9:10 pm.

Course Philosophy, Description and Objectives:

A course, which integrates basic principles from various mathematical domains. The course will emphasize interrelationships among those principles and alternate conceptual representations of them. The representations will be analyzed to determine the mathematical skills and conceptual levels necessary to understand them.

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

- A. An appreciation (growth mindset) of the discipline of mathematics itself.
- B. An understanding of how students learn and construct ideas in active, inquiry-based learning.
- C. An ability to design and select challenging, open mathematical tasks, and create problem-solving environments.
- D. The ability to integrate appropriate, mathematically meaningful assessment within the teaching process.

One of the main components of teaching is helping students to “discover and construct” mathematics for themselves by creating successful inquiry-based, active learning environments, a friendly atmosphere, and an “open mind” approach. The goal of teaching mathematics is for students to develop understandings, not just for students to find the correct answer, but to find answers using the “best” methods. Hence, a teacher needs to promote students’ thinking, to encourage searching for different methods leading to mathematical understanding (including through failure). Discovery learning is enhanced with error analysis and trial and error. The role of the teacher is to integrate novelty to engage students by posing challenging problems and encourage students to invent new ways of approaching the problem without fear of making a mistake.

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, 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 effective teaching to provide opportunities for successful learning. Emphasis is placed on the equity principle (learning for all) and development of conceptual understanding of topics, as well as project/problem-based learning. Topics will be chosen from: number concepts and relationships, fundamental ideas of number theory, discrete mathematics, probability and statistics, numerical literacy, Euclidean and non-Euclidean geometry, transformational geometry, patterns, variables, and functions, multiple representations of functions, mathematical modeling, and concepts of calculus.

Specifically, students will become more effective in the following areas by:

- A. Deepening students’ understanding of math concepts by comprehending math texts, interpreting symbols and representations, making connections, explaining and communicating their understanding.
- B. Developing problem solving skills (making sense of problems, using visual representations, trying multiple strategies, and persevering);
- C. Students will cultivate a growth mindset through reflection and self-awareness; and
- D. Exploring innovative learning theories and techniques of teaching and learning including problem-based and inquiry, open-ended approach.
- E. Studying how to apply general and content methods of teaching and learning in diverse classroom settings.
- F. Helping the students to create successful learning environment in teaching and learning.
- G. Writing and analyzing lesson plans that support the learning cycle.
- H. Unpacking state standards for specific content areas and developing practical and engaging use of state standards/TEKS, and NCTM Standards.
- I. Demonstrating use of educational technology within lesson plan development and mini-teaching experiences.
- J. Demonstrating understanding of critical reading of texts and web sites through writing and discussion.
- K. Demonstrating reflection about teaching and learning through writing and discussion.
- L. Writing and discussion to demonstrate an informed perspective about curriculum and related educational issues.
- M. Addressing the domain and competencies that will prepare you for state certification content exam (TExES).

Course Structure:

Class for this course are online (UTEP Blackboard). Class will be a combination of videos, readings, Blackboard discussion boards, individual/group course assignments and tasks, and project development. It is expected that students will participate in all activities and components of the course.



Materials/resources we will be using:

Required readings/videos will be provided on blackboard, or you will be provided with appropriate web links.

Additional Resources:

English Language Proficiency (ELPS) Standards:

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

Principles and Standards for School Mathematics Executive Summary

https://www.nctm.org/uploadedFiles/Standards_and_Positions/PSSM_ExecutiveSummary.pdf

Constructivism: <https://www.funderstanding.com/theory/constructivism/>

Lev Vygotsky and Social Cognition

<https://www.funderstanding.com/category/theory/vygotskysocial-cognition/>

Student Assessment

<https://tea.texas.gov/student-assessment>

STAAR Mathematics Resources

<https://tea.texas.gov/student-assessment/testing/staar/staarmathematics-Resources>

STAAR Interim assessments

<https://tea.texas.gov/student-assessment/testing/staar/staarinterim-Assessments>

Texas Essential Knowledge and Skills (TEKS) for all content areas and grade levels

<https://tea.texas.gov/academics/curriculum-standards/teks/texas-essential-knowledge-and-skills>

Common Core Standards

<https://study.com/teach/common-core-math-standards.html>

Texas Education Agency (TEA): <http://www.tea.state.tx.us/index.aspx>

Texas Examinations of Educator (TExES) Standards: <http://www.texas.ets.org/texas/>



Texas English Language Proficiency (TELPAS) Standards:

<http://www.tea.state.tx.us/student.assessment/ell/telpas/>

National Council for Teachers of Mathematics (NCTM) publications (most journals are Available free via UTEP electronic Library Databases).

- These websites provides a wide selection of virtual manipulatives interactive games for teaching mathematics:

<http://nlvm.usu.edu/en/nav/vlibrary.html>

<http://www.shodor.org/interactivate/activities/>

<http://www.fi.uu.nl/rekenweb/en/>

<http://www.internet4classrooms.com/index.htm>

These websites describe different aspects of math representations

<http://www.abstractmath.org/MM/MMRepsModels.htm>

http://en.wikipedia.org/wiki/Multiple_representations_%28mathematics_education%29

<https://www.showme.com/topic/math>

<http://continuities.wordpress.com/2010/04/25/sharing-multiple-representations-of-systems/>

http://www.losmedanos.edu/deved/documents/m25_student_work.multiple_representations_000.pdf

<https://ctlonline.org/?s=representations>

<http://www.shodor.org/interactivate/activities/>

<http://www.fi.uu.nl/rekenweb/en/>

<http://www.internet4classrooms.com/index.htm>

<http://nlvm.usu.edu/en/nav/vlibrary.html>

- Book "How Students Learn". You can read it online at (free download)

<https://nap.nationalacademies.org/catalog/11101/how-students-learn-mathematics-in-the-classroom>

- Book "Adding It Up: Helping Children Learn Mathematics".



You can read it online (free download)

<https://nap.nationalacademies.org/catalog/10434/helping-children-learn-mathematics>

Software Requirements:

- A. Adobe® Reader® is free software that allows everyone from business professionals to home users to view easily and reliably, 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.

COURSE ASSIGNMENTS

The schedule of assignments and classroom discussions may change over the course of the semester. These modifications will be based on the specific needs of students in the course and will not exceed the difficulty or the due dates of the originally proposed assignment. Any changes to the syllabus will be announced in class and through Blackboard. Every student is responsible for these changes and should regularly check Blackboard for updated content, assignments, and announcements.

Please keep your assignments organized. It will serve to work on the final reflection/self-evaluation of your thinking as it evolves over the semester.

Weekly Assignments:

You will be asked to complete weekly assignments. These assignments will be diverse and may include assigned readings, solving or analyzing mathematical tasks, watching a video, participating in discussion boards, analyzing student work, or preparing activities. Completing these assignments is a critical part of your coursework.

Attendance and Participation (25% of the grade, will be posted at the end of semester)

This is an online course; virtual attendance is required. Attendance is determined by class participation online. Participation on Blackboard is provided in Evaluation Blackboard Dashboard. The record of attendance will be taken daily.

Students are required to access the Blackboard at least on Monday, Wednesday and Saturday, and always check their Blackboard email, and reply to the Blackboard email messages they received.

Please, remember that all the students are required to work individually, and your solutions/explanations should be written in your own words. Misspelled words in your submissions are not acceptable. You are required to use free version of Grammarly.com to check your email messages, postings, math solutions and reflections.

NO LATE WORK is allowed. Instructor will drop students who violate rules of the class.

Class introductions, reflections on readings, solution of math problems and final reflection paper

(15 x 5 points = 75%).



Blackboard discussions

For this online course, students will be required to participate in Blackboard discussion board. For discussion board participation, I encourage you to write 100-150 words in your post in response to the provided guiding questions. You should also reply (at least 25 words for each response) to the entries of at least three of your peers for each assigned discussion (unless noted otherwise). Refer to the discussion board and course content to further details on each assignment. The deadline for postings is 11:59 pm MST every Sunday.

Written Reflection Papers

Students will be asked to synthesize what you are reading and integrate it with the classroom activities in relation to the guiding topic connected to secondary teaching and learning. Weekly reflections specifications: APA format (preferred), 12-point font, New Times Roman, Double Spaced, (specific number of words), save as .docx. The deadline for postings is 11:59 pm MST every Sunday.

Extra Credit

In some assignments, there will be Extra Credit section that you can complete. Total number of points for each Extra Credit is 5 points (for each submission). Extra Credit will be graded at the end of the semester.

Final Reflection/ self-evaluation guidelines

You will reflect and consider the extent to which you:

- solve mathematical problems
- actively engaged and participated in class activities
- made connections between readings, NCTM and TEKS standards
- challenged yourself to go beyond what felt comfortable or familiar
- grew in your capacity to support all students to engage in authentic learning experience
- grew in your capacity to cultivate every student's identity as a valued intellectual contributor to a learning community
- advocate for your own learning
- fulfilled your obligations as a responsible professional
- understand TEKS standards as the core of your teaching practices
- learned about yourself, as a learner and a teacher

Final reflections specifications: APA format, 12-point font, New Times Roman, Double Spaced, 4-5 pages, save as .docx.



The deadline for postings of Final reflections is May 8, 11:59 pm MST, the date will be sent to you via Blackboard email.

TECHNOLOGY REQUIREMENTS

Blackboard information

An online collaborative environment, Blackboard (available from "My UTEP.EDU" at <https://my.utep.edu>) is used to provide course interactions, and each participant must be able to use their UTEP Blackboard account. You **MUST** have both a UTEP email address and password to take this course -- this is because the online course environment, Blackboard utilizes your UTEP email username and password. Because the course is taught in a fully online manner, you cannot effectively participate without access to the online course environment.

The instructor will not accept projects or course materials that are not submitted through the UTEP Blackboard system

The following link

<https://my.utep.edu/My> gives you access to ALL UTEP online functions: Blackboard, Goldmine, and Webmail, among others. If you have trouble, the UTEP Information Systems help desk number is 915-747-4357 - (747-HELP), and online at <https://www.utep.edu/technologysupport/>.

Alternative means of submitting work in case of technical issues

If Blackboard is down and you cannot get into our course site to post work by the required due date, you should email helpdesk@utep.edu, receive case number assigned to you and email this case number to me via regular UTEP email.

ALL coursework should be posted in our BB online course site. If you find that you are unable to log into Blackboard to access our course site at the time that you are trying to post your work by the due date, you must email me **IMMEDIATELY WITH AN ATTACHMENT OF YOUR WORK**. When you do this, I will know that you have completed the work in a timely manner and it will be accepted, even though it was not posted in our course site as is generally required. I will then check with the Technology staff at UTEP to determine when Blackboard was out. If you email me indicating that, you did not post your coursework because Blackboard is down, but you do not send me your work as an attachment in the message, you will not receive credit for your work.

File Names for submitted work

File names for documents submitted by students should follow these guidelines: (1) No spaces in the names, (2) appropriate file extensions such as docx or pptx for the file type, (3)"Lastnamefirstname_exercisename.xxx". Failure to follow these requirements impedes the ability to download and exchange documents among course participants and will result in a reduced grade, or even no grade. For example, having a space in a file name will often lead to a file that is incompletely uploaded or downloaded, or that is turned in, as an unidentifiable file. That is a complication of web servers, not a course issue. Replacing all spaces with an underscore (_) or a dash (-) avoids this problem.



Plagiarism Checking Software

We shall be using an originality checking service to evaluate the level of originality in papers written in this course. Students are required to abide by the UTEP Plagiarism and copyright policies as stated in the Academic Policies section below.

Academic Policies

SCHOLASTIC INTEGRITY. Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at the University of Texas at El Paso must be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) for possible disciplinary action. Student's work will be checked for plagiarism via a software tool, and the re-use of extensive passages of text, whether cited or not, constitutes plagiarism. Work turned in will be checked for originality, and all work must pass an evaluation of writing originality.

UTEP Resources

Below are a few of the UTEP's resources to aid students' success.

UTEP Library

<https://www.utep.edu/library/>

Student Success Help Desk

https://www.utep.edu/advising/student_resources/student-success-helpdesk.html

UTEP Academic Advising Center

<https://www.utep.edu/advising/>

Tutoring Services

<https://www.utep.edu/tutoring/>

Office of Student Financial Aid

<https://www.utep.edu/student-affairs/financialaid/contact-us/>

More Student Resources



<https://www.utep.edu/student-affairs/resources/>

University Writing Center (UWC): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.

<https://www.utep.edu/uwc/>

Counseling and Psychological Services

<https://www.utep.edu/student-affairs/counsel/resources/>

Accommodations Policy

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services (CASS). Contact the Center for Accommodations and Support Services at 915-747- 5148, or email them at cass@utep.edu, or apply for accommodations online via the CASS portal at

<https://www.utep.edu/student-affairs/cass/>

Useful Resource Links

UTEP MS Office and other free software for UTEP students

https://www.utep.edu/technologysupport/ServiceCatalog/SOFT_AllSoftware.html

UTEP MS Office free for students link

https://www.utep.edu/technologysupport/ServiceCatalog/SOFTWARE_PAGES/soft_microsoftoffice365.html

APA 7 Formatting Style Guide at the OWL at Purdue

https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/general_format.html

NETIQUETTE



In an online classroom, our primary means of communication is written. The written language has many advantages: more opportunity for reasoned thought, more ability to go in-depth, and more time to think through an issue before posting a comment. However, written communication also has certain disadvantages, such a lack of the face-to-face signaling that occurs through body language, intonation, pausing, facial expressions, and gestures. As a result, please be aware of the possibility of miscommunication, compose your comments in a positive, supportive, and constructive manner and consider the following:

- Remember that your posts are public. All class participants will be reading any postings.
- Respect and courtesy must always be provided to classmates and to instructor.
- Make a point to be kind and respectful in your comments—even if you disagree with someone. No harassment or inappropriate postings will be tolerated.
- When reaching to someone else’s message, address the ideas, not the person and stay on-topic. Post only what anyone would comfortably state in a F2F situation.
- Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space. If students wish to do so, they have the ethical obligation to first request the permission of the writer(s).
- Submit files the right way. If you do not follow instructions, you are taking the risk that your instructor will not be able to find or open your assignment. Save yourself and your instructor a headache and read their instructions carefully before submitting.

Table 1. Student learning outcomes and assessment

COURSE SPECIFIC STANDARDS	Measurements (means of assessment for student learning outcomes listed in first column)
Understand how children learn and develop mathematical skills, procedures, and concepts; know the typical students' errors and misconceptions; and uses this knowledge to plan, organize, and implement instruction to meet curriculum goals.	Class Participation, Assignments, Reflections and Discussions.
Build your capacity to teach mathematics in ways that leverage students' diverse strengths to explore important mathematical ideas and support all students to engage in authentic mathematical work by unpacking NCTM standards and developing the competencies to teach the TEKS.	Class Participation, Assignments, Reflections and Discussions.
Learn the specific mathematical topics and mathematical processes for teaching through exploring how students learn, engaging in	Class Participation, Assignments, Reflections and Discussions.



instructional activities, and reflecting on your learning.	
Connect mathematical content strands with mathematics to pedagogy, developing our capacity to enact ambitious and equitable teaching practices.	Class Participation, Assignments, Reflections and Discussions.
Explore and use technology to appropriately teach and prepare students to use mathematics according to the statewide curriculum (TEKS).	Class Participation, Assignments, Reflections and Discussions.
Understand and use numbers (structure, operations, and algorithms), patterns, functions, algebraic thinking, problem-solving strategies, and data analysis to teach the statewide curriculum (TEKS). Understand the relationship between the different symbolic representations.	Class Participation, Assignments, Reflections and Discussions.
Understand assessment and use a variety of formal and informal assessment techniques to guide instruction and support student progress.	Class Participation, Assignments, Reflections and Discussions.

The course's learning outcomes will require the student to acquire throughout the semester knowledge and skills and build upon them. The following table provides a list of the most relevant student learning outcomes for the course. The following outcomes are aligned with SBEC-approved Texas educator standards. Please, see the full standard at

<https://tea.texas.gov/texas-educators/preparation-and-continuing-education/approved-educator-standards>

POLICIES:

A. Grading Scale:

Excellent	Above Average	Average	Below Average	Failing
A = 90 – 100%	B = 80 – 89%	C = 70 – 79%	D = 60 – 69%	F = 59% and below

B. Submission of Assignments:

Assignments are to be submitted through Blackboard (either by Blackboard mail or in the Discussion folder) on the date and time indicated by assignment. **Late assignment submissions will not be accepted. There will be many opportunities to get points for submitting extra credit 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. 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).

E. 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 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>> .

F. 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 show 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 .

G. Professionalism:

Consistent commitment to being successful in the course as well as, collegiality, supportive critique, and professionalism will be expected.

Course expectations:

- Attend virtual meetings when you are scheduled to attend meetings (virtual meetings with peers, instructor, etc.)
- Be prepared to raise, share, discuss and attempt to solve any individual or collective problems you may have with your colleagues and/or your instructor in constructive ways that allows us all to maintain our dignity and continue to function effectively as a community.
- Demonstrate an understanding that while we can, and will, disagree, we need to do so within a community of respect; and
- Provide your classmates with supportive critique and constructive feedback.

Tentative Online Course Outline: MTED 5322 SPRING 2024

NOTE: All topics, assignments, and due dates are subject to change at the instructor's discretion.

Week/Day	Learning Agenda/Assignments	Assignment Due Date
Week 1 - 2	<u>Introductions. Specific instructions are posted in Discussion folder "Week 1 Week 2 Assignment 1"</u>	Saturday of Week 2 11:59 pm
Week 3 - 4	Specific instructions are provided via BB email on Blackboard	Saturday of Week 4



		11:59 pm
Week 5- 6	Specific instructions are provided via BB email on Blackboard	Saturday of Week 6 11:59 pm
Week 7 - 8	Specific instructions are provided via BB email on Blackboard	Saturday of Week 8 11:59 pm
Week 9 - 10	Specific instructions are provided via BB email on Blackboard	Saturday of Week 10 11:59 pm
Week 11 - 12	Specific instructions are provided via BB email and Discussion "Week 6, MTED 5322" on Blackboard	Saturday of Week 12 11:59 pm
Week 13 -14 - 15	Specific instructions are provided via BB email on Blackboard	Saturday of Week 15 11:59 pm

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

Copyright:

Our online course site is copyrighted and is the property of UTEP faculty. Content from the course site, in part or whole, may not be shared or distributed without direct written permission.

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

