

University of Texas at El Paso
College of Education
MTED 3330 – 15708 (Hybrid)
Spring 2018

Integration and Alternative Representation of Math Principles

Class meeting time: Thursdays, 6 pm - 8:50 pm.

Location: EDUC 402

Instructor Contact Information:

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Office Hours: Thursdays, 5:00 – 6 pm, 8:50 – 9:50 PM, or by appointment.
(EDUC 402)

Materials/resources we will be using:

- State Board for Educator Certification (SCEC)
http://tea.texas.gov/About_TEA/Leadership/State_Board_for_Educator_Certification/
- This website includes resources for revised Texas Essential Knowledge and Skills (TEKS) for all grade levels (Mathematics).
<http://tea.texas.gov/index2.aspx?id=6148>
- Texas College Readiness Standards
<http://www.thecb.state.tx.us/collegereadiness/CRS.pdf>
- Common Core Standards
<http://www.corestandards.org/>
- National Council for Teachers of Mathematics (NCTM)
<http://www.nctm.org/>
<http://standardstrial.nctm.org/triallogin.asp>
<http://www.cssu.org/cms/lib5/VT01000775/Centricity/Domain/32/CSSUMathCurricMay04.pdf>
<http://www.education.com/reference/article/history-mathematics-education-NCTM/>
- Book " Measuring What Counts: A Conceptual Guide for Mathematics Assessment"
http://www.nap.edu/catalog.php?record_id=2235
- Book "Measuring Up: Prototypes for Mathematics Assessment"
http://www.nap.edu/catalog.php?record_id=2071

- Book "Knowing What Students Know: The Science and Design of Educational Assessment"

http://www.nap.edu/catalog.php?record_id=10019

- Book "How Students Learn: Mathematics in the Classroom". You can read it online at http://www.nap.edu/catalog.php?record_id=11101

- Book "Adding It Up: Helping Children Learn Mathematics". You can read it online at <http://books.nap.edu/books/0309069955/html/>

- Book "High School Mathematics at Work"

<http://www.nap.edu/openbook.php?isbn=0309063531>

- Critical Issue: Providing Hands-On, Minds-On, and Authentic Learning Experiences in Mathematics

<http://www.ncrel.org/sdrs/areas/issues/content/ntareas/math/ma300.htm>

- The Trends in International Mathematics and Science Study - is a world-wide assessment and research project that conducts mathematics and science assessments to 4th and 8th grade students from more than 60 countries including the United States every four years.

<http://timssandpirls.bc.edu/>

<http://timssvideo.com>

- These websites describe different aspects of math representations

<http://www.learner.org/courses/teachingmath/>

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

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

<http://www.pictorialmath.com/Home.html>

<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

<http://ctlonline.org/blog/?p=357>

- 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>

- Math Activities and Blackline Masters

<http://www.ixl.com/?gclid=CMWO9Z3i6KoCFZYb2godPmnQOw>
http://wps.ablongman.com/ab_vandewalle_math_6/

Materials: You will need to bring to each class session laptop, and/or smartphone.
Other things that might be useful: calculator, graph paper, poster board, colored pens, scissors and tape.

Course description

MTED 3330. Integ & Alter Rep of Math Prin.

Integration and Alternative Representation of Basic Mathematical Principles (3-0) A course which integrates basic principles from various mathematical domains. 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. . .

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 how students learn and construct ideas,
- C. An ability to design and select challenging tasks, create problem-solving environment,
- D. The ability to integrate appropriate, mathematically meaningful assessment with the teaching process.

One of the main components of teaching is helping children to “discover” mathematics for themselves by creating successful learning environment, friendly atmosphere, and “open mind” approach. The goal of mathematical training is not only to find the correct answer, but to find it using the "best" method; hence teacher needs to promote students' thinking, to encourage searching for different methods leading to the same answer; When a mistake is made in one of the methods, the other methods will help children to arrive to correct answer, so it is very important not to give children the right answer, but allow them to arrive to it, may be through a sequence of mistakes, and corrections of the mistakes. Children should get a lot of practice in solving a variety of problems; the role of teacher is to select the true variety, to engage children by posing challenging problems and encouraging students to creatively 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 in the mathematics classrooms.

Course Objectives:

- Explore innovative learning theories and techniques of teaching and learning mathematics: using multiple representations, problem-based, inquiry, open-ended approaches.

- Study how to apply general and content methods of teaching and learning K-12 mathematics in diverse classroom settings.
- Help the students to create successful learning environment in teaching and learning of secondary mathematics.

Understanding Representations

“The term *representation* refers both to process and to product—in other words, to the act of capturing a mathematical concept or relationship in some form and to the form itself. ...”

“Some forms of representation—such as diagrams, graphical displays, and symbolic expressions—have long been part of school mathematics....”

“Representations should be treated as essential elements in supporting students' understanding of mathematical concepts and relationships; in communicating mathematical approaches, arguments, and understandings to one's self and to others; in recognizing connections among related mathematical concepts; and in applying mathematics to realistic problem situations through modeling. New forms of representation associated with electronic technology create a need for even greater instructional attention to representation.” (NCTM, Representation Standard).

Course Structure:

Each face-to-face class session will consist of a brief lecture and/or students' interactive discussion/presentation, and problem solving activities. The discussion will focus on how the lessons exemplify the given standard, on how to assess the effectiveness of the lesson, and on modifications and improvements. You will be required to take notes during each class session.

During online sessions you will be asked to read mathematics education papers and chapters from the book, write reflections and participate in online discussion (all these activities will be conducted via Blackboard).

Course Requirements and Assignments

- Each **attendance and participation** (with positive attitude) will count towards final grade. It will be taken each meeting using a sign-in sheet (which is your responsibility to make sure you sign); sometimes you will be asked to sign in the beginning of class session, and at the end of class session. Your active participation and positive attitude towards learning innovative ideas about mathematical pedagogy in each class session is vital to your learning as well as to the learning of other students in the class. The instructor may count late arrival, early departure, or blatant nonparticipation as a half-absence or even a full absence, depending on what is missed. We meet only once a week and most of the activities in this course involve collaborative learning, group activities or discussions. Students may miss a total of two classes, and these absences may be excused and/or unexcused absences.
Each absence will affect your grade.
- I hold the right to drop a student from a course after two absences.

- The official UTEP attendance policy for undergraduate students is as follows:
“The student is expected to attend all classes and laboratory sessions. It is the responsibility of the student to inform each instructor of extended absences. When, however, in the judgment of the instructor, a student has been absent to such a degree as to impair his or her status relative to credit for the course, the instructor may drop the student from the class with a grade of “W” before the course drop deadline and with a grade of “F” after the course drop deadline.” (UTEP Undergraduate Catalog).
- Assigned readings are a vital aspect of the course. You will be asked to write reflections on your readings, research, virtual manipulatives and educational apps, and create your own math activities using manipulatives and technology.
- During some sessions quizzes on assigned readings will be conducted.
- You will be asked to take reflection notes during or after each class session.
- There will be several **comprehensive exams, quizzes,** and ongoing **group/individual presentations.**
- We will be using Electronic Databases from UTEP Library on a continuous basis. Make sure to become familiar with this wonderful resource. Part of every assignment would include some relevant search in Electronic Database.
- **Organizing/facilitating interactive Discussions/Presentation.**
- Each group will be prepared to facilitate interactive discussions with students from the class.
You will present the selected chapter and your Meta lesson using interactive activities. Your role is to be "peer leaders", that is while other students work in small groups, you will be providing content activities, and will help to maintain and encourage student interest and focus on conceptual understanding through a Socratic questioning dialog. You should also promote interaction within and among groups participated in content activities. The ultimate goal: by participating in hands-on activities, students will be actively constructing their own knowledge and deepen their understanding of mathematical concepts and procedures (group work).
- **Extra Credit:** you will have several opportunities to receive extra credit, e.g., you will be invited to participate in service learning, tutoring, participate in College of Education focus groups, surveys, conferences etc.

The main criteria for evaluation of the organization and conduct of interactive Discussions/Presentations are following:

1. **Content Activities design:** Your content activities should correspond to assigned topic. The activities could be enhanced by your own ideas, examples from mathematics

- teaching observation, ideas from other resources (please, provide proper references for all the resources you will be using) (10%)
2. **Content Area Knowledge:** Group members should be confident in the mathematics content area. They should be aware of various approaches addressing solution of the concept-related questions, and be able to respond to various questions accurately, appropriate authentic assessment (30%)
 3. **Level of challenge:** Content activities should motivate students' learning and address creativity, critical and high-order thinking skills development (10%)
 4. **Level of class involvement:** You should demonstrate good communication skills, encourage students to share their ideas, and orchestrate the whole class discussion. Specifically, questions from other students and professor should be encouraged during the whole presentation (not just at the end). Number of questions asked, and answers provided would be one of the main criteria for evaluation (20%)
 5. **Level of instructional materials preparation and application:** The use of a variety of instructional materials including manipulatives, visuals, and technology tools (10%)
 6. **Written report (activities, transcript/description of discussion questions, etc.)** (20%)

Student Learning Outcomes

The course's learning outcomes will require the student to acquire throughout the semester new 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.

These outcomes are also aligned with NCTM Representation Standard that states the following:

Instructional programs from prekindergarten through grade 12 should enable all students to—

- [create and use representations](#) to organize, record, and communicate mathematical ideas;
- [select, apply, and translate](#) among mathematical representations to solve problems;
- [use representations to model](#) and interpret physical, social, and mathematical phenomena.

Table 1. Student learning outcomes and assessment

	Student Learning Outcomes	Assessment
	<i>By the end of course, the successful student will be able to:</i>	<i>To evaluate these outcomes, the faculty member will use the following assessment procedures:</i>
1	Develop an understanding of current issues, practices and directions in mathematics curriculum and the ability to inquire into these.	a. Class interactive discussions and b. Blackboard discussions
2	Develop knowledge and skills in educational research.	a. Class interactive discussions/presentations and b. Blackboard discussions
3	Identify and analyze topics of importance in current mathematical education.	a. Class interactive discussions/presentations.

		b. Blackboard discussions
		c. Graded Electronic Databases Literature searches.
4	Deepen their commitment to their pupils' learning of mathematics.	a. Class interactive discussion.
5	Increase their confidence to teach mathematics	a. Pre/Post-Test, Presentations and Discussion
6	Improve their ability to manage and assess their pupils' mathematics learning. Discover innovative methods of instruction to increase effectiveness and pupils' engagement, learning, and thinking.	a. Class interactive discussions/presentations
		b. Blackboard discussions
		c. Pre/Post-Test, Pre/Post-survey.
7	Improve their capacity to think reflectively and creatively about their teaching of mathematics.	a. Class interactive discussions/presentations
		b. Blackboard discussions
		c. Pre/Post-Test, Pre/Post-survey.
8	Increase their capacity to become an agent of change in the field of mathematics education.	a. Pre/Post-Test, Pre/Post-survey.
9	Develop knowledge and strategies to design curriculum at classroom and school levels.	a. Class interactive discussions/presentations
		b. Blackboard discussions
		c. Pre/Post-Test, Pre/Post-survey.

Assessment and Grading:

Your grade will be determined by the level of you fulfilling the following requirements. There are five benchmarks for this course. Your success in fulfilling these benchmarks will determine your grade for the course:

- A. Grade "A": Student meets all the requirements, completes all assignments, and turns in all assignments (including tests) on time. The average grade for assignments (including all extra credit) and tests is A.
- B. Grade "B": Student meets all the requirements, but does not complete all assignments, submits some assignments after the due date, has excessive absences. The average grade for assignments (including all extra credit) and tests is B.
- C. Grade "C": Student does not meet all of the benchmarks, does not complete all assignments, submits most assignments after the due date, and has excessive absences.

The average grade for assignments (including all extra credit) and tests is C.

Each month cumulative grade for that month will be provided.

Requirements for course success:

1. You should become an expert in working with UTEP Library electronic database.
2. You should become knowledgeable and proficient in working with Blackboard.

- You will work as a cooperative member of the community of learners that comprises this class.

Grade Distribution

Active Participation/Positive Attitude	10 points each module	30
Reflections/Quizzes	10 Reflections/Quizzes	100
Presentations	24 points each (2 presentations)	48
Interactive Discussions	5 points each (10 Bb discussions)	50
Test/Final Paper		24
	Point Total	252

Points Earned		Letter Grade
227	90%	A
202	80%	B
176	70%	C
151	60%	D
<151	<60%	F

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.

Participants are expected to abide by the UTEP policies concerning academic honesty. Specifically:

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 person's as ones' own. And, 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. Violations will be taken seriously and will be referred to the Dean of Students Office for possible disciplinary action. Students may be suspended or expelled from UTEP for such actions.

(Source: http://cetalweb.utep.edu/sun/cetal/events/docs/Academic_Dishonesty.htm).

The course instructor reserves the right to adjust the course syllabus or change assignments as needed.

Table 2. Tentative Course Schedule

Date	Assignment
Week 1 January 18: F2F	Introduction: course content. Presentation of materials posted on Blackboard.
	Quiz #1. Pre-Test. Discussion on Pedagogical Content Knowledge.
	Presentation of UTEP Library electronic databases.
Week 2 January 25: F2F	Search activities for relevant articles in Math Education journals. Students' presentations. Presentation of materials posted on Blackboard. Please, follow assignment guidelines posted in the BB Discussion Forum "Week 2" (if available).
Week 3, February 1: F2F	Specific instructions (if available) will be posted in BB, Discussion Forum "Week 3" .
Week 4, February 8: ONLINE	Specific instructions (if available) will be posted in BB, Discussion Forum "Week 4" .
Week 5 February 15: F2F	Mayan Inspired Representation. Specific instructions (if available) will be posted in BB, Discussion Forum "Week 5".
Week 6 February 22: F2F	Mayan Inspired Representation. Specific instructions (if available) will be posted in BB, Discussion Forum "Week 6".
Week 7 March 1: ONLINE	Specific instructions (if available) will be posted in BB, Discussion Forum "Week 7" .
Week 8 March 8: F2F	Hands-on Activities, presentations. Specific instructions (if available) will be posted in BB, Discussion Forum "Week 8" .
Week 9 March 22: F2F ONLINE	Specific instructions will be posted in BB, Discussion Forum "Week 9".

Week 10 March 29: F2F	Hands-on Activities, presentations. Specific instructions (if available) will be posted in BB, Discussion Forum “Week 10”.
Week 11 April 5: ONLINE	Hands-on Activities, presentations. Specific instructions (if available) will be posted in BB, Discussion Forum “Week 11”.
Week 12 April 12: F2F	Specific instructions (if available) will be posted in BB, Discussion Forum “Week 12”.
Week 13 April 19:	Manipulatives Presentation. Specific instructions (if available) will be posted in BB, Discussion Forum “Week 13”.
Week 14 April 26: F2F ONLINE	Specific instructions (if available) will be posted in BB, Discussion Forum “Week 14”.
Week 15 May 3:	Manipulatives Presentation. Submit your final Presentation paper, 3 pages (via Blackboard email, subject “Final Presentation Paper.”)
	Deadline is December 14, 11 pm, MT.
Final Exam Week	Post-Test.

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 Center for Accommodations and Support Services (CASS) located in Union E Room 106. Students who have been designated as having a disability must reactivate their standing with CASS 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 CASS. You may call 747-5148 for general information about the Americans with Disabilities Act (ADA).

Equal Educational Opportunity

In order 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 on the basis of 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>>.

Appendices: Relevant Rubrics

Grading Rubric for Online Discussion

Points	5	3 to 4	1 to 2
Analysis / Interpretation	The message uses sources, including outside as well as required reading. In addition, it demonstrates that the student has gained new understanding of the topic.	Some messages do analysis or interpretation well, but a significant number do not. This might be because the analysis was not done well or because it was not attempted (that is, was simply opinion).	Messages generally show little evidence of analysis, consisting instead of opinion and feelings and impressions.
Writing Skill	Sentences are clear and wording is unambiguous. Correct word choice, correct spelling, and correct grammar. Writing style can still be conversational rather than formal. The writing does not have to be flawless, but it will be better than average writing.	Ordinary, good writing. Lapses are regular and patterned, but do not undermine the communication or the persuasiveness of the argument.	Grammar, spelling, and/or word choice errors are frequent enough that the sense of the message is lost or muddled.
Participation	Messages contribute to ongoing conversations, as replies to questions or comments, or as new questions or comments. Messages that originate a thread usually generate responses. Student does not start a topic or pose a question and then abandon it.	Some messages contribute to ongoing conversations, but others are disconnected. If the student starts a new thread, sometimes there is follow-up but sometimes there isn't. Student tries to further the class discussion but is not successful a significant number of times. Or, student posts a significant (though still a minority) number of messages that are off-the-cuff and do not contribute substantively.	Messages are unconnected with what others are saying, as if there is no conversation. No replies to other messages. Student never answers someone else's question. When student asks a question, there's no acknowledgment to any responses.

Grading Rubric for Short Reflection

Category & points	Exceeds Standards (8-10 points)	Meets Standards (4-7 points)	Does not Meet Standards (1-3 points)
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Short Reflection	The piece is thoughtful, engaging, and clearly written. The piece shows careful consideration of the topic at hand. It responds directly to the question or prompts and makes meaningful connections with the readings and course content. The piece has been proofread.	Shows adequate reflection along with some level of thoughtfulness, and may or may not have responded directly to the question or prompt. It also contain grammatical or sentence structure errors that disrupt the flow of the narrative.	Does not adequately address the question or prompt, and shows limited thoughtfulness.
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Grading Rubric for Presentation

Category & points	Good (8-10 points)	Fair (4-7 points)	Poor (1-3 points)
Knowledge of Content and Summary	Solid knowledge and understanding of the topic to be presented is demonstrated. The presentation is clear and understandable.	Good knowledge and understanding of the topic to be presented is demonstrated. The presentation is clear and understandable, but some important points are not addressed.	Weak knowledge and understanding of the topic to be presented is demonstrated. The presentation is unclear.
Critical Thinking and Argumentation (this is applicable only if presenting the review of the article).	Strengths and weaknesses that are central to the key points of the article are addressed. The discussion of strengths and weaknesses take up the majority of the assignment.	Strengths and weaknesses that are peripheral to the article are addressed. The discussion of strengths and weaknesses take up the majority of the assignment.	Strengths and weaknesses are addressed peripherally or not at all. The discussion of strengths and weaknesses take up only a small part of the assignment.
Organization and Communication Accuracy	The presentation is well organized, has a very clear intro, body and conclusion. The purpose of the presentation is clear from the very beginning. There are no grammatical errors or typos. APA and page length requirements (if applicable for the assignment) are met.	The presentation is organized, has an intro, body and conclusion. The purpose of the paper becomes clear within the paper. There are few grammatical errors or typos. APA and page length requirements (if applicable for the assignment) are met.	The presentation is not well organized, has an unclear or non-existent intro, body and conclusion. The purpose of the paper is unclear. There are many grammatical errors and/or typos. APA and page length requirements (if applicable for the assignment) are not met.

	applicable for the assignment) are met.		assignment) are not met.
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Participation Rubric

Throughout the semester students are expected to:

- Be present (in mind and body) and be well prepared for class.
- Participate fully in class activities and assignments – take an active part in the work of small and large group; participate in discussions and attend class face-to-face sessions. Understand your roles and responsibilities in acquiring Student Learning Outcomes for this class.
- Make insightful comments, informed by required reading and your own critical thinking. Demonstrate reflections on your readings. Come to class with questions, comments and thoughts on readings.
- Treat class activities, group discussions as important components of the course, showing respect for fellow classmates and the course material.

Participation points will be assigned based on the extent to which students meet the above criteria.

Description of performance	Points earned
Student exceptionally and consistently demonstrates the criterion throughout the semester	4
Student proficiently and frequently demonstrates the criterion throughout the semester	3
Student satisfactory and intermittently demonstrates the criterion throughout the semester	2
Student inadequately and sporadically demonstrates the criterion throughout the semester	1
Student does not demonstrates the criterion throughout the semester	0

Copyright Notice

Many of the materials that are posted within this course are protected by copyright law.

These materials are only for the use of students enrolled in this course and only for the purpose of this course. They may not be further retained or disseminated.

***The course instructor reserves the right to adjust the course syllabus or change assignments as needed. Remember that our course syllabus and class schedule are living documents and can change.**