University of Texas at El Paso
College of Education

SPRING 2014
SCED 4367 (CRN 22362, Hybrid)
Teaching Mathematics in Secondary School

This syllabus is subject to change as needed. Any changes to the syllabus will be announced in class and/or posted on Blackboard.

Class meeting time: 5:30 pm - 8:20 pm, Wednesdays, LART 208.
Location: face-to-face sessions and labs will be meeting in LART 208, online sessions will be conducted via Blackboard.

No ringing 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.

Instructor Contact Information:
Ruby Lynch-Arroyo, PhD, Department of Teacher Education
Phone or Text Message: 915-588-9226
E-mail: rlynch@miners.utep.edu or text message with name included (best means of contact)
Office Hours: Wednesdays, 8:20 p.m. - 9:30 p.m., Sunday, online 7:00 – 8:00 pm, or by appointment.

The following is the link to this book on Amazon.com: http://www.amazon.com/Teaching-Mathematics-Sourcebook-Activities-Strategies/dp/0205292569

Other materials/resources we will be using:
- This website includes all the Texas Essential Knowledge and Skills (TEKS) for all content areas and grade levels.
  http://ritter.tea.state.tx.us/rules/tac/chapter111/index.html
- Texas College Readiness Standards
  http://www.thecb.state.tx.us/index.cfm?objectid=EADF962E-0E3E-DA80-BAAD2496062F3CD8
- Common Core Standards
  http://www.corestandards.org/
  - National Council for Teachers of Mathematics (NCTM)
    http://www.nctm.org
    http://standardstrial.nctm.org/triallogin.asp
    - NCTM curriculum focal points
      http://www.nctm.org/focalpoints/
    - This website provides a wide selection of virtual manipulatives for teaching mathematics:
      http://nlvm.usu.edu/en/nav/vlibrary.html
    - Book "High School Mathematics at Work"
      http://www.nap.edu/openbook.php?isbn=0309063531
1.13.14

- 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/
- “Why Problem-Based Learning Is Better”. Posted by Tim Holt on Jan 10, 2013 in Less
teacher, More Student, Making The Shift, The How of 21st Century Teaching, Voices
http://plpnetwork.com/2013/01/10/problem-vs-project-based-learning/
- “Emphasis on math, science needed in Texas”, Luce,
- Dana Center website. This site provides great ideas for teaching mathematics.
http://www.utdanacenter.org

This course will integrate English Language Proficiency Standards (ELPS) for English
Language Learners (ELLs) in order to provide strategies for language acquisition and academic
success in all content areas for students at different levels (beginning, intermediate, advanced, and
advanced high) in the domains of listening, speaking, reading and writing. You can find the ELPS
standards and presentations about ELPS and Texas English Language Proficiency Assessment
System (TELPAS) at http://www.esc4.net/users/0001/docs2/122-ELPS.pdf

http://www.tea.state.tx.us/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=2147501849&libID=214750
1843

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

Materials: You will need to bring to each class session a scientific calculator. Other things
that might be useful throughout the semester include: ruler, graph paper, poster board, colored
pencils/markers, scissors and tape.

Course Philosophy

"Teaching is a lifelong art that ... involves continuous learning not just for the
student but for the teacher as well." -- Joseph Katz and Mildred Henry

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 environment;
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” mathematics for
themselves by creating successful learning environments, a friendly atmosphere, and an 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, a 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 students to arrive at
a correct answer, so it is very important not to give students the right answer, but allow them
to arrive to it, possibly through a sequence of mistakes [error analysis], and corrections of the mistakes.

Students should get a lot of practice in solving a variety of problems; the role of teacher is to select the true variety, to engage students 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 secondary mathematics classrooms.

**Course Objectives:**
Students enrolled in this course will explore the methods of teaching mathematics in secondary classrooms. Emphasis is placed on the equity principle (mathematics for all) and development of conceptual understanding of mathematics topics. Specifically, students will:

- Explore innovative learning theories and techniques of teaching and learning mathematics: problem-based, inquiry, open-ended approach.
- Study how to apply general and content methods of teaching and learning secondary mathematics in diverse classroom settings.
- Help the students to create successful learning environment in teaching and learning of secondary mathematics.

**Course Structure:**
Each face-to-face class session will consists 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 extensions, 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 or in class).

**Course Requirements and Assignments**

**Attendance and participation**
[*See grading procedure below]: It is EXTREMELY important that you attend class and lab regularly AND on time. Because classroom discussion and participation in presentations and activities are essential to learning from this course, **all students will be graded on their prompt arrival to class, attendance, and participation in class.** Attendance 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.

Class activities will include participation in whole class and small group discussions, initiating discussion(s), respectfully and insightfully responding to, and engaging in discussion with the instructor and other students.

(Points procedure on not attending class)
*You have ONE FREE day to miss class. What you do with that day is up to you, so use it wisely! **After one missed day, for every day that you miss class, 8 points will be subtracted from your OVERALL point total.** Each absence will affect your grade. I reserve the right to drop a student from a course after two absences. *If you are more than 20 minutes late to class, it will be counted as an absence. Attendance at a math related conference, such as NCTM, will not be considered as the “one free day” with documentation provided. However, you will be expected to make up any missed assignments/class work and submit a summary of your learning experience as a result of attending the conference. This summary must be 2 pages typed, double spaced, 12 point font, and may include artifacts from the conference as attachments.

**Note:** If you are having personal, academic, professional or other issues that are inhibiting or will inhibit your attendance and performance in this course, please come and talk to me about it. My desire is for everyone to succeed in this course.

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).

**Assignments**

- Assigned readings are a vital aspect of the course. You will be asked to write reflections on your readings, research, and create your own math activities using manipulatives and technology. Writing should be scholarly reflections not summaries. If you use material from readings you are expected to cite, or it will be considered plagiarism. At this level in your college career, writing submitted should be free of spelling and grammar errors in APA style [see grading rubric]. If you need assistance with writing, contact the UTEP Writing Center and/or have someone else read what you have written before submitting.
- Some on-line 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 two comprehensive exams (one in March and one in May), and ongoing team presentations.
Organizing/Facilitating Interactive Discussions/Presentation.
Each group will be prepared to facilitate interactive discussions with other students in the class. You will teach the objectives of the selected chapter and your Meta lesson using interactive activities. Your role is to be "peer leaders" and "peer teachers", 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). All members of a presenting group should be “actively” involved in the interactive discussion at all times.

The main criteria for evaluation of the organization and conduct of Interactive Discussions and Presentations are as follows:

1. **Content Activities design**: Your content activities should correspond to assigned topic. The activities should be enhanced by your own ideas, examples from mathematics teaching observation, ideas from other resources (please, provide proper references/citations 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. (10%)

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 the instructor 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. (25%)

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** (Lesson Plan describing activities, assessment, discussion questions, etc.) (35%)

**Lab:**

As identified in the schedule, there may be a ‘Lab’ time identified prior to a face to face class meeting. Lab time will be from 5:30 – 6:15 and will be held in the same room as the class will meet. Lab sessions will have an assigned task and allow for group meeting time to discuss and prepare Interactive Discussions and Presentations. Attendance during lab is NOT OPTIONAL and is considered as part of attendance tracking.

**Extra Credit:**

You will have many opportunities to receive extra credit. For example, you may be invited to participate in service learning, tutoring, participate in College of Education focus groups, surveys, conferences etc. Extra credit will also be awarded to those students who present documentation that they have taken the practice test on certifyteacher.com [10
points]. An additional 10 points will be awarded to those students who present documentation that they have passed the mathematics section on certifyteacher.com. Bonus points [10 points] will be given for attendance at a math-related conference, upon submission of a summary of your learning experience as a result of attending the conference. This summary must be 1 page typed, double spaced, 12 point font, and may include artifacts from the conference as attachments.

**Guiding Principles for this Course:**

*Texas State Examination: TEXES Exam #135 Mathematics 8-12 [Preparation Manual Posted on Blackboard]*

**Competency Domain I: Number Concepts**
The mathematics teacher understands, and uses numbers, number systems and their structure, operations, and algorithms, quantitative reasoning and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

**Competency Domain II: Patterns and Algebra**
The mathematics teacher understands and uses patterns, relations, functions, algebraic reasoning, analysis and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

**Competency Domain III: Geometry and Measurement**
The mathematics teacher understands and uses geometry, spatial reasoning, measurement concepts and principles and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

**Competency Domain IV: Probability and Statistics**
The mathematics teacher understands and uses probability and statistics, their applications and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

**Competency Domain V [Standards V and VI]: Mathematical Processes and Perspectives**
The mathematics teacher understands and uses mathematical processes to reason mathematically, to solve mathematical problems, to make mathematical connections within and outside of mathematics and to communicate mathematically [Standard V].

The mathematics teacher understands the historical development of mathematical ideas, the interrelationship between society and mathematics, the structure of mathematics and the evolving nature of mathematics and mathematical knowledge [Standard VI].

**Competency Domain VI [Standards VII and VIII]: Mathematical Learning, Instruction and Assessment**
The mathematics teacher understands how children learn and develop mathematical skills, procedures and concepts; knows typical errors students make; and uses this knowledge to plan, organize, and implement instruction to meet curriculum goals and to teach all students to understand and use mathematics [Standard VII].

The mathematics teacher understands assessment, and uses a variety of formal and informal assessment techniques appropriate to the learner on an ongoing basis to monitor and guide instruction and to evaluate and report student progress [Standard VIII].

**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. Please, see the full standard® at [http://www.sbec.state.tx.us/sbeconline/standtest/standards/8-12math.pdf](http://www.sbec.state.tx.us/sbeconline/standtest/standards/8-12math.pdf)


**Table 1. Student learning outcomes and assessment**

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<thead>
<tr>
<th>TeXes 8-12</th>
<th>Student Learning Outcomes</th>
<th>Assessments</th>
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<tbody>
<tr>
<td>By the end of course, the student will be able to:</td>
<td>To evaluate these outcomes, the faculty member will use the following assessment procedures:</td>
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<tr>
<td>V, VI</td>
<td>Develop an understanding of current issues, practices and directions in mathematics curriculum and the ability to inquire into these.</td>
<td>a. Class and online interactive discussions; b. Quizzes and exams; and c. Reflections</td>
</tr>
<tr>
<td>V, VI</td>
<td>Develop knowledge and skills in educational research.</td>
<td>a. Class and online interactive discussions &amp; presentations; b. Quizzes and exams; and c. Reflections</td>
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<tr>
<td>V, VI</td>
<td>Identify and analyze topics of importance in current mathematical education.</td>
<td>a. Class and online interactive discussions/presentations.; b. Quizzes and exams; c. Graded Electronic Databases Literature searches; and d. Reflections</td>
</tr>
<tr>
<td>ALL</td>
<td>Deepen their commitment to their pupils’ learning of mathematics.</td>
<td>a. Pre/Post-Test; b. Pre/Post-survey; and c. Reflections</td>
</tr>
<tr>
<td>ALL</td>
<td>Increase their confidence to teach mathematics.</td>
<td>a. Pre/Post-Test; b. Pre/Post-survey; and c. Reflections</td>
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<tr>
<td>V, VI</td>
<td>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.</td>
<td>a. Class and online interactive discussions/presentations; b. Quizzes and exams; c. Pre/Post-Test, Pre/Post-survey; and d. Reflections</td>
</tr>
<tr>
<td>ALL</td>
<td>Improve their capacity to think reflectively and creatively about their teaching of mathematics.</td>
<td>a. Class and online interactive discussions/presentations; b. Quizzes and exams; c. Pre/Post-Test, Pre/Post-survey; and d. Reflections</td>
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<tr>
<td>ALL</td>
<td>Increase their capacity to become an agent of change in the field of mathematics education through effective teaching and communication.</td>
<td>a. Pre/Post-Test; b. Pre/Post-survey; c. Class Discussions and Presentations; and d. Reflections.</td>
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<tr>
<td>ALL</td>
<td>Develop knowledge and strategies to design curriculum at classroom and school levels.</td>
<td>a. Class and online interactive discussions/presentations; b. Quizzes and exams; c. Pre/Post-Test, Pre/Post-survey; d. Research and Reflections.</td>
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Assessment and Grading:
If you maintain high expectations of your students as an educator, students will rise to those expectations. I have high expectations of each and every student, particularly those students who are pursuing a career as a professional educator. Each of you has the ability to meet these expectations, as long as you see yourself pursuing a profession that critically impacts the lives of our children! Notice I stated ‘profession’ not a ‘job’; being an educator is one of the most important roles you can play in our society today!

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

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.

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.

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.

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

Grading
I will provide graded feedback on your performance (the special grading schedule is explained below). Every week I will select randomly several submissions, and grade them and provide feedback to students (if necessary).

Grade Distribution
| Active Participation/Positive Attitude/ Attendance | 15% |
| Reflections/Quizzes | 25% |
| Presentations /Interactive Discussions | 25% |
| Online Discussions | 10% |
| Tests | 25% |
| **100%** |

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<th>GRADE</th>
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<tr>
<td>A</td>
<td>93 - 100</td>
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<tr>
<td>B</td>
<td>85 - 92</td>
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<tr>
<td>C</td>
<td>75 - 84</td>
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<tr>
<td>D</td>
<td>65 - 74</td>
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<td>F</td>
<td>0 - 64</td>
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**Academic Integrity**

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.

As teachers and future teachers, you should be especially aware that cheating, plagiarism and collusion in dishonest activities are serious acts which erode the university’s purpose and integrity and cheapen the learning experience for us all. It is expected that individual work you submit will represent your own effort and will not involve copying from or accessing unauthorized resources.

It is expected that work you submit will represent your own effort (or your own group’s effort, if it is a group project), will not involve copying from or accessing unauthorized resources or people (e.g., from a previous year’s class), and will appropriately acknowledge allowable references that you do consult. Violations are unacceptable and will be referred to the Dean of Students Office for possible disciplinary action.

Don’t resubmit work completed for other classes without specific acknowledgment and permission from me.

**For Group Work:** Within a group, members are allowed to divide up subsets of the project for which individuals will take the initial responsibility for coordinating efforts, but it is assumed that by the time a group turns in a write-up that all members have read, discussed, and understand all parts of what is being turned in. Group members may even discuss general ideas and strategies with members of other groups, but NOT share parts of actual written work.

**If you have or suspect a disability and need accommodations you should contact The Center for Accommodations and Support Services (CASS) at 747- 5148 or at cass@utep.edu or go by Room 106 Union East Building.**

**Students with disabilities:** If you have or believe that you have a disability, you may wish to self-identify. You can do this by contacting the Center for Accommodations and Support Services (CASS) to show documentation of a disability or to register to receive testing and services. CASS provides the following services: note taking, sign language, interpreter, reader and/or scribe services, priority registration, adaptive technology, diagnostic testing for learning disabilities, assistance with learning strategies/tutoring, alternative testing location and format, and advocacy. All information provided to CASS is kept with the strictest rules of confidentiality.

*It is responsibility of any student desiring to drop the course to turn in necessary drop forms. The instructor will not drop students who are no longer attending the class. The instructor will not drop a student after the last day to drop. You are responsible for your own record. The instructor can drop any student any time a student violates the written rules/requirements for remaining in
good standing in the course. I hold the right to drop a student from a course after two absences. The course instructor reserves the right to adjust the course syllabus or change assignments as needed.
Table 2. Tentative Course Schedule

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<tr>
<th>TeXes</th>
<th>Date</th>
<th>Assignment</th>
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<tr>
<td>V, VI</td>
<td>Jan 22, 2014</td>
<td>Lab: Read &quot;Adventures in Teaching: A Professor Goes to High School to Learn about Teaching Math”, Darryl Young. [Copy Provided or can be retrieved from <a href="http://www.ams.org/notices/201210/rtx121001408p.pdf">http://www.ams.org/notices/201210/rtx121001408p.pdf</a> ] With a partner Prepare commentary [5-10 sentences] about a salient point the author makes that you feel is most important to teaching high school mathematics – explain why you think it is important giving specific examples. Commentary will be shared in class for further class review and turned in for participation points.</td>
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<td>F2F/Lab</td>
<td>In-Class Review: Lab Reading and Commentary. Walk-about in pairs. Introduction: syllabus, course content. Presentation of materials posted on Blackboard. Pre-survey.</td>
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<td>Homework: Due January 26th at 11:59 pm. Read syllabus and calendar and send to instructor two questions (by-email on Blackboard) about the class and/or syllabus;</td>
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<td>Read Introduction from &quot;How Students Learn&quot; (the url address is provided in the syllabus, pp 1-26). <a href="http://www.nap.edu/catalog.php?record_id=11101">http://www.nap.edu/catalog.php?record_id=11101</a>; and</td>
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<td>Discussion Board participation: please, follow assignment guidelines posted in the Blackboard Topic &quot;Week 1&quot; (if available).</td>
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<td>Pretest:</td>
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<td>I - IV</td>
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### TeXes 
### Date 
### Assignment

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<tr>
<th>TeXes</th>
<th>Date</th>
<th>Assignment</th>
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<tbody>
<tr>
<td>V, VI</td>
<td>Week 2</td>
<td>Lab: Bring textbooks and review each chapter briefly. Determine which chapter [of those selected by instructor] you will teach/present.</td>
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<td>Jan 29, 2014</td>
<td>During Lab session we will set the groups and assign the presentations for the entire semester.</td>
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<td>With a partner Prepare commentary [5-10 sentences] about a salient point the author makes that you feel is most important to teaching high school mathematics – explain why you think it is important giving specific examples. Commentary will be shared in class for further class review and turned in for participation points.</td>
</tr>
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<td></td>
<td>F2F/O-Lab</td>
<td>In-Class Review: Lab Reading and Commentary. Walk-about in pairs.</td>
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<td>Chapter 1, Soebel &amp; Maletsky – The Art of Teaching. Popcorn out Sections of Chapter from group readings. Complete Activity 5 on page 31</td>
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<td><strong>Homework:</strong> Due February 2nd at 11:59 pm.</td>
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<td><strong>Write</strong> reflections on your readings: (1page, Times New Roman, double space, 12 pt. font, save in pdf format) Review the Syllabus and Rubric for guidelines and grading.</td>
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<td><strong>Submit</strong> your work in the Discussion Folder with your name. Subject of your message: &quot;Week 3 Reflection&quot;.</td>
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<td>Discussion Board participation: please, follow assignment guidelines posted in the Blackboard Topic “Week 2” (if available). Online Discussion (read at least two other students reflections, and reply).</td>
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<td>TeXes</td>
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<td>Assignment</td>
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<tr>
<td>V, VI</td>
<td>Week 3</td>
<td><strong>Lab:</strong> Read Education News, &quot;Report: Teacher Training Programs Need Reform&quot; [posted on Blackboard]. Write your own definition of a “learner-ready teacher” for class discussion AND read “Takeaways from Math Methods: How Will You Teach Effectively?”, Jennifer Bay-Williams. [Copy Provided or can be retrieved from <a href="http://www.edutopia.org/blog/takeaways-math-methods-teach-effectively-jennifer-bay-williams">http://www.edutopia.org/blog/takeaways-math-methods-teach-effectively-jennifer-bay-williams</a>] Meet with your Interactive Discussions/Presentations/Explorations Group and assign roles and duties. Schedule times to work on presentations. <strong>In-Class Review:</strong> Review of definitions of a “learner-ready” teacher and Takeaway teaching methods Lab Reading and Commentary. Popcorn out Sections of Chapter from group readings. Prepare and present one concept from assigned group section for the class. <strong>Homework:</strong> Due February 9th <strong>at 11:59 pm</strong> Read pp. 163 - 206 from e-book &quot;How Students Learn: Mathematics in the Classroom&quot; <a href="http://www.nap.edu/catalog.php?record_id=11101">http://www.nap.edu/catalog.php?record_id=11101</a> Write reflections on your readings: (1 page, Times New Roman, double space, 12 pt. font, save in pdf format) Review the Syllabus and Rubric for guidelines and grading. Submit your work in the Discussion Folder with your name. Subject of your message: &quot;Week 3 Reflection&quot;. Online Discussion (read at least two other students reflections, and reply).</td>
</tr>
<tr>
<td>I, V, VI</td>
<td>Week 4</td>
<td><strong>Lab:</strong> Read NCTM hand-out, “Are we there yet? A Journey through Our Solar System” and solve assigned problems for extra credit [Due February 16th at 11:59 PM]. Meet with your Interactive Discussions/Presentations/Explorations Group and assign roles and duties. Schedule times to work on presentations. <strong>In-Class Review:</strong> Chapter 3, Soebel &amp; Maletsky – Motivating Problem Solving Instruction. Popcorn out Sections of Chapter from group readings. Prepare and present one concept from assigned group section for the class. <strong>Homework:</strong> Due February 16th <strong>at 11:59 pm</strong> Research and Read two scholarly articles on integration of technology into mathematics teaching in addition to highschoolnotes. 'Magic Pen' Helps High School Teachers Dig Deeper Into Math Lessons, Kelsey Sheehy, Retrieve from <a href="http://www.usnews.com/education/blogs/high-school-notes/2012/09/04/magic-pen-helps-high-school-teachers-dig-deeper-into-math-lessons">http://www.usnews.com/education/blogs/high-school-notes/2012/09/04/magic-pen-helps-high-school-teachers-dig-deeper-into-math-lessons</a> Write reflections on your readings: (1 page, Times New Roman, double space, 12 pt. font, save in pdf format) Review the Syllabus and Rubric for guidelines and grading. Submit your work in the Discussion Folder with your name. Subject of your message: &quot;Week 4 Reflection&quot;. Include sources/websites for articles. Online Discussion (read at least two other students reflections, and reply).</td>
</tr>
<tr>
<td>TeXes</td>
<td>Date</td>
<td>Assignment</td>
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<tr>
<td>I, V, VI</td>
<td>Week 5</td>
<td><strong>Online:</strong> Technology Quest - Find 3 websites that provides interactive high school mathematics learning opportunities to share with the class. Using rubric, write a review/evaluation of the websites and post on Blackboard in discussion board provided. <strong>Due: February 23rd at 11:59 pm</strong></td>
</tr>
<tr>
<td>ALL – Technol.</td>
<td>Feb 19, 2014 Online</td>
<td>Meet [virtually or F2F] with your Interactive <strong>Discussions/Presentations/Explorations</strong> Group and assign roles and duties. Schedule times to work on presentations. Post progress notes on Blackboard.</td>
</tr>
<tr>
<td>II: HW</td>
<td>Week 5</td>
<td><strong>Online:</strong> Technology Quest - Find 3 websites that provides interactive high school mathematics learning opportunities to share with the class. Using rubric, write a review/evaluation of the websites and post on Blackboard in discussion board provided. <strong>Due: February 23rd at 11:59 pm</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Write</strong> reflections on your readings: (1page, Times New Roman, double space, 12 pt. font, save in pdf format) Review the Syllabus and Rubric for guidelines and grading. <strong>Submit</strong> your work in the Discussion Folder with your name. Subject of your message: “Week 5 Reflection”..</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Online Discussion (read at least two other students reflections, and reply with your thoughts on the writing).</td>
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<tr>
<td></td>
<td></td>
<td><strong>Online Assignment:</strong> Due March 2nd at 11:59 pm</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Homework:</strong> Meet [virtually or F2F] with your Interactive <strong>Discussions/Presentations/Explorations</strong> Group and assign roles and duties. Schedule times to work on presentations. Post progress notes on Blackboard.</td>
</tr>
<tr>
<td>ALL</td>
<td>Week 7</td>
<td><strong>Lab:</strong> Complete Mid-Term Exam Review [Chapters 1-3 and All Readings/Class Presentations &amp; Discussions]</td>
</tr>
<tr>
<td></td>
<td>Mar 5, 2014 F2F/O-L/Lab</td>
<td>Meet with your Interactive <strong>Discussions/Presentations/Explorations</strong> Group and assign roles and duties. Schedule times to work on presentations. Post Progress Notes on Blackboard.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>In-Class Review:</strong> Chapter 4 – Activities with Numerical Concepts. Interactive <strong>Discussions/Presentations/Explorations</strong> through hands-on activities (check the calendar for information on what groups are presenting).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Complete and turn in peer review worksheets.</td>
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<td></td>
<td></td>
<td><strong>Homework:</strong></td>
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<td></td>
<td><strong>On-Line/Blackboard Midterm Exam: Opens March 6th. Due 11:59 pm on March 19th. Two Attempts Allowed.</strong></td>
</tr>
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<td></td>
<td>Week 8</td>
<td><strong>SPRING BREAK</strong></td>
</tr>
</tbody>
</table>
### TeXes Date Assignment

| III, V, VI | Week 9 | Mar 19, 2014 | Lab: One-time ONLY opportunity to work on and turn in any ‘redo’ work or missing assignments! Due: March 23rd at 11:59 pm.  
Meet with your Interactive Discussions/Presentations/Explorations Group and assign roles and duties. Schedule times to work on presentations. Post progress notes on Blackboard  
**In-Class Review:** Chapter 5 – Activities in Algebra Discussions/Presentations/Explorations through hands-on activities (check the calendar for information on what groups are presenting). Complete and turn in peer review worksheets.  
**Homework:** Due March 23rd at 11:59 pm  
Write reflections on your readings: (1page, Times New Roman, double space, 12 pt. font, save in pdf format) Review the Syllabus and Rubric for guidelines and grading.  
Submit your work in the Discussion Folder with your name. Subject of your message: “Week 9 Reflection”..  
Online Discussion (read at least two other students reflections, and reply with your thoughts on the writing). |
| IV, V, VI | Week 10 | Mar 26, 2014 | Lab: Review website certifyteacher.com  
Meet with your Interactive Discussions/Presentations/Explorations Group and assign roles and duties. Schedule times to work on presentations. Post progress notes on Blackboard  
**In-Class Review:** Chapter 6 – Activities in Geometry. Interactive Discussions/Presentations/Explorations through hands-on activities (check the calendar for information on what groups are presenting). Complete and turn in peer review worksheets.  
**Homework:** Due March 30th at 11:59 pm  
Read Geometric Mean – What Does It Mean?, Kalder  
Write reflections on your readings: (1page, Times New Roman, double space, 12 pt. font, save in pdf format) Review the Syllabus and Rubric for guidelines and grading.  
Submit your work in the Discussion Folder with your name. Subject of your message: “Week 10 Reflection”..  
Online Discussion (read at least two other students reflections, and reply with your thoughts on the writing). |
<table>
<thead>
<tr>
<th>TeXes</th>
<th>Date</th>
<th>Assignment</th>
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</thead>
<tbody>
<tr>
<td>ALL</td>
<td>Week 11</td>
<td>Lab: Read</td>
</tr>
<tr>
<td></td>
<td>F2F/O-L/Lab</td>
<td>Write one paragraph on identifying and addressing math anxiety in your students. Submit for Participation Grade.</td>
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<td></td>
<td>In-Class Review: Chapter 7 – Activities in Probability and Statistics. Interactive Discussions/Presentations/Explorations through hands-on activities (check the calendar for information on what groups are presenting). Complete and turn in peer review worksheets.</td>
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<td></td>
<td>Homework: Due April 6th at 11:59 pm</td>
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<td></td>
<td></td>
<td>Write reflections on your readings: (1 page, Times New Roman, double space, 12 pt. font, save in pdf format) Review the Syllabus and Rubric for guidelines and grading. Submit your work in the Discussion Folder with your name. Subject of your message: “Week 11 Reflection”.</td>
</tr>
<tr>
<td></td>
<td>April 4, 2014</td>
<td>Course Drop Deadline</td>
</tr>
<tr>
<td>V, VI</td>
<td>Week 12</td>
<td>Lab: Work on Final Reflection – Review rubric.</td>
</tr>
<tr>
<td></td>
<td>Apr 9, 2014</td>
<td>In-Class Review: Chapter 8 – Iteration Activities and Fractal Patterns. Interactive Discussions/Presentations/Explorations through hands-on activities (check the calendar for information on what groups are presenting). Complete and turn in peer review worksheets.</td>
</tr>
<tr>
<td></td>
<td>F2F/O-L/Lab</td>
<td>Homework: Due April 13th at 11:59 pm</td>
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<td></td>
<td></td>
<td>*Sections assigned alphabetically: IF THE LETTER OF YOUR LAST NAME BEGINS WITH A-C, READ THE FIRST 25 PAGES AND WRITE CORNELL NOTES ON THOSE PAGES.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IF THE LETTER OF YOUR LAST NAME BEGINS WITH D-G, READ THE PAGES 26 - 51 AND WRITE CORNELL NOTES ON THOSE PAGES.</td>
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<tr>
<td></td>
<td></td>
<td>IF THE LETTER OF YOUR LAST NAME BEGINS WITH H - L, READ THE PAGES 52 - 78 AND WRITE CORNELL NOTES ON THOSE PAGES.</td>
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<tr>
<td></td>
<td></td>
<td>IF THE LETTER OF YOUR LAST NAME BEGINS WITH M - P, READ THE PAGES 79 - 104 AND WRITE CORNELL NOTES ON THOSE PAGES.</td>
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<tr>
<td></td>
<td></td>
<td>IF THE LETTER OF YOUR LAST NAME BEGINS WITH Q - T, READ THE PAGES 105- 130 AND WRITE CORNELL NOTES ON THOSE PAGES.</td>
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<tr>
<td></td>
<td></td>
<td>IF THE LETTER OF YOUR LAST NAME BEGINS WITH U- Z, READ THE PAGES 131 - 154 AND WRITE CORNELL NOTES ON THOSE PAGES.</td>
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<td></td>
<td></td>
<td>EVERYONE READ THE CONCLUSIONS AND WRITE CORNELL NOTES ON THAT SECTION ALSO.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>POST ALL CORNELL NOTES ON DISCUSSION BOARD - READ NOTES FOR SECTIONS YOU WEREN'T ASSIGNED AND STATE YOU READ THEM AS A COMMENT IN THE DISCUSSION BOARD.</td>
</tr>
<tr>
<td>TeXes</td>
<td>Date</td>
<td>Assignment</td>
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<tr>
<td>V, VI</td>
<td>Week 13</td>
<td>Lab: Develop your ideal grading system and explain how you would implement it when teaching high school and why it would be appropriate.</td>
</tr>
</tbody>
</table>
| ALL: Posttest | Apr 16, 2014 | Resources:  
Leading to Change / Effective Grading Practices  
Douglas B. Reeves February 2008 | Volume 65 | Number 5  
Teaching Students to Think Pages 85-87  
http://www.ascd.org/publications/educational-leadership/feb08/vol65/num05/Effective-Grading-Practices.aspx  
Grades and Grading Policies What do Grades Really Mean By Melissa Kelly | http://712educators.about.com/od/gradingsystems/a/Grades-And-Grading-Policies.htm  |
| ALL | Week 14 | Lab: For the given state assessment data set provided, perform data analysis and identify three critical academic concerns, relating to the TEKS, that should be addressed and explain why.  
In-Class Review: Integration of Summative Assessment and Data Mining for Effective Teaching; Wiggins. In Class Notes  
Homework: From the Chapter you presented, create drafts of [not copy or reinvent] two final exam assessment items in any format – open-ended, multiple choice, vocabulary, etc. The question may relate to math content or pedagogy. The question may be in any format: open-ended (short answer, fill in the blank(s)), matching, multiple choice - any format you choose. Bring the two items to class on April 30th. |
| ALL V, VI | Week 15 | Lab: Post-Survey  
In-Class Review: How to Write Forms of Assessment Items. From the Chapter you presented create [not copy or reinvent] two assessment items in any format – open-ended, multiple choice, vocabulary, etc. The question may relate to math content or pedagogy. The question may be in any format: open-ended (short answer, fill in the blank(s)), matching, multiple choice - any format you choose. Trade and Solve. Submit in Class.  
Homework: Work on Final Reflection, Due May 14th |
| ALL V, VI | Week 16 | Online: Complete Final Exam Review [All Chapters, All Readings, All Classroom discussion & activities]  
Work on Final Reflection – Peer Edit.  
Homework: Complete and Submit Final Reflection and Final Exam.
<table>
<thead>
<tr>
<th>TeXes</th>
<th>Date</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>Week 17</td>
<td>Final reflection paper due. Submit via Blackboard no later than 11:59 pm on May 14th. Final</td>
</tr>
<tr>
<td></td>
<td>May 14</td>
<td>Exam on Blackboard: Due May 14th at 11:59 PM. Opens May 7th. One Attempt</td>
</tr>
<tr>
<td></td>
<td>Online</td>
<td></td>
</tr>
</tbody>
</table>

**Final Word**

*I reserve 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.*
**Grading Rubric for Online Discussion**

<table>
<thead>
<tr>
<th>Points</th>
<th>5</th>
<th>3-4</th>
<th>1-2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analysis / Interpretation</strong></td>
<td>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.</td>
<td>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).</td>
<td>Messages generally show little evidence of analysis, consisting instead of opinion and feelings and impressions.</td>
</tr>
<tr>
<td><strong>Writing Skill</strong></td>
<td>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.</td>
<td>Ordinary, good writing. Lapses are regular and patterned, but do not undermine the communication or the persuasiveness of the argument.</td>
<td>Grammar, spelling, and/or word choice errors are frequent enough that the sense of the message is lost or muddled.</td>
</tr>
<tr>
<td><strong>Participation</strong></td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>
### Grading Rubric for Short Reflection

<table>
<thead>
<tr>
<th>Category</th>
<th>Exceeds Standard</th>
<th>Meets Standard</th>
<th>Does not Meet Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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.</td>
<td>Shows adequate reflection along with some level of thoughtfulness, and may or may not have responded directly to the question or prompt. It also contains grammatical or sentence structure errors that disrupt the flow of the narrative.</td>
<td>Does not adequately address the question or prompt, and shows limited thoughtfulness.</td>
</tr>
<tr>
<td>Points</td>
<td>(10-8)</td>
<td>(7-4)</td>
<td>(3-1)</td>
</tr>
</tbody>
</table>

### Grading Rubric for Presentation

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Good (10-8 pts)</th>
<th>Fair (7-4 pts)</th>
<th>Poor (3-1 pts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of Content and Summary</td>
<td>Solid knowledge and understanding of the topic to be presented is demonstrated. The presentation is clear and understandable.</td>
<td>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.</td>
<td>Weak knowledge and understanding of the topic to be presented is demonstrated. The presentation is unclear.</td>
</tr>
<tr>
<td>Critical Thinking and Argumentation (this is applicable only if presenting the review of the article).</td>
<td>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.</td>
<td>Strengths and weaknesses that are peripheral to the article are addressed. The discussion of strengths and weaknesses take up the majority of the assignment.</td>
<td>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.</td>
</tr>
<tr>
<td>Organization and Communication Accuracy</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>
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 and online 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.

<table>
<thead>
<tr>
<th>Description of performance</th>
<th>Points earned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student <strong>exceptionally and consistently</strong> demonstrates the criterion throughout the semester</td>
<td>4</td>
</tr>
<tr>
<td>Student <strong>proficiently and frequently</strong> demonstrates the criterion throughout the semester</td>
<td>3</td>
</tr>
<tr>
<td>Student <strong>satisfactory and intermittently</strong> demonstrates the criterion throughout the semester</td>
<td>2</td>
</tr>
<tr>
<td>Student <strong>inadequately and sporadically</strong> demonstrates the criterion throughout the semester</td>
<td>1</td>
</tr>
<tr>
<td>Student <strong>does not</strong> demonstrates the criterion throughout the semester</td>
<td>0</td>
</tr>
</tbody>
</table>
Final Reflection Rubric

<table>
<thead>
<tr>
<th>Category</th>
<th>Exceeds Standard</th>
<th>Meets Standard</th>
<th>Does not Meet Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Critical Thinking and Argumentation</em></td>
<td>The piece is thoughtful, engaging, and clearly written. The piece shows careful consideration of the topic at hand.</td>
<td>Shows adequate reflection along with some level of thoughtfulness, and may or may not have responded directly to the question or prompt, and shows limited thoughtfulness.</td>
<td></td>
</tr>
<tr>
<td><em>Points</em></td>
<td>(10-8)</td>
<td>(7-4)</td>
<td>(3-1)</td>
</tr>
<tr>
<td><em>Knowledge of Content</em></td>
<td>The sections of the reflection make meaningful connections with prior and additional readings and course content.</td>
<td>The sections of the reflection make meaningful connections with prior readings and course content.</td>
<td>The sections of the reflection do not make meaningful connections with prior readings or additional readings and course content.</td>
</tr>
<tr>
<td><em>Points</em></td>
<td>(10-8)</td>
<td>(7-4)</td>
<td>(3-1)</td>
</tr>
<tr>
<td><em>Structure of the Reflection: Organization &amp; Communication Accuracy</em></td>
<td>The final reflection is well organized, has a very clear Intro, body and conclusion. The purpose of the reflection 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 piece has been proofread.</td>
<td>The final reflection is organized, has an intro, body and conclusion. The purpose of the reflection becomes clear within the paper. There are few grammatical errors or typos. APA and page length requirements (if applicable for the assignment) are met.</td>
<td>The final reflection is not well organized, has an unclear or non-existent intro, body and conclusion. The purpose of the reflection is unclear. There are many grammatical errors and/or typos. APA and page length requirements (if applicable for the assignment) are not met.</td>
</tr>
<tr>
<td><em>Points</em></td>
<td>(10-8)</td>
<td>(7-4)</td>
<td>(3-1)</td>
</tr>
<tr>
<td><em>Total Points</em></td>
<td>(30-24)</td>
<td>(21-12)</td>
<td>(9-3)</td>
</tr>
</tbody>
</table>

Final Reflection Paper Topic: “My Mathematics Teaching Philosophy”

The paper must address the following:

- Accessing Prior Knowledge
- The Role of Assessment
- Concrete Instruction
- Content Knowledge
- Differentiated Instruction
- Pedagogical Knowledge
- Multiple Solution Finding
- Teaching Methods
- Multiple Learning Styles
- Any other topics you feel are important


Title: Final.Reflection_YourName_Spring.2014_SCED.4367
COMPETENCIES

DOMAIN I — NUMBER CONCEPTS

COMPETENCY 001
THE TEACHER UNDERSTANDS THE REAL NUMBER SYSTEM AND ITS STRUCTURE, OPERATIONS, ALGORITHMS AND REPRESENTATIONS.

The beginning teacher:

A. Understands the concepts of place value, number base and decimal representations of real numbers.

B. Understands the algebraic structure and properties of the real number system and its subsets (e.g., real numbers as a field, integers as an additive group).

C. Describes and analyzes properties of subsets of the real numbers (e.g., closure, identities).

D. Selects and uses appropriate representations of real numbers (e.g., fractions, decimals, percents, roots, exponents, scientific notation) for particular situations.

E. Uses a variety of models (e.g., geometric, symbolic) to represent operations, algorithms and real numbers.

F. Uses real numbers to model and solve a variety of problems.

G. Uses deductive reasoning to simplify and justify algebraic processes.

H. Demonstrates how some problems that have no solution in the integer or rational number systems have solutions in the real number system.

COMPETENCY 002
THE TEACHER UNDERSTANDS THE COMPLEX NUMBER SYSTEM AND ITS STRUCTURE, OPERATIONS, ALGORITHMS AND REPRESENTATIONS.

The beginning teacher:

A. Demonstrates how some problems that have no solution in the real number system have solutions in the complex number system.

B. Understands the properties of complex numbers (e.g., complex conjugate, magnitude/modulus, multiplicative inverse).

C. Understands the algebraic structure of the complex number system and its subsets (e.g., complex numbers as a field, complex addition as vector addition).

D. Selects and uses appropriate representations of complex numbers (e.g., vector, ordered pair, polar, exponential) for particular situations.

E. Describes complex number operations (e.g., addition, multiplication, roots) using symbolic and geometric representations.
COMPETENCY 003
THE TEACHER UNDERSTANDS NUMBER THEORY CONCEPTS AND PRINCIPLES AND USES NUMBERS TO MODEL AND SOLVE PROBLEMS IN A VARIETY OF SITUATIONS.

The beginning teacher:
A. Applies ideas from number theory (e.g., prime numbers and factorization, the Euclidean algorithm, divisibility, congruence classes, modular arithmetic, the fundamental theorem of arithmetic) to solve problems.
B. Applies number theory concepts and principles to justify and prove number relationships.
C. Compares and contrasts properties of vectors and matrices with properties of number systems (e.g., existence of inverses, non-commutative operations).
D. Uses properties of numbers (e.g., fractions, decimals, percents, ratios, proportions) to model and solve real-world problems.
E. Applies counting techniques such as permutations and combinations to quantify situations and solve problems.
F. Uses estimation techniques to solve problems and judges the reasonableness of solutions.

COMPETENCY 004
THE TEACHER USES PATTERNS TO MODEL AND SOLVE PROBLEMS AND FORMULATE CONJECTURES.

The beginning teacher:
A. Recognizes and extends patterns and relationships in data presented in tables, sequences or graphs.
B. Uses methods of recursion and iteration to model and solve problems.
C. Uses the principle of mathematical induction.
D. Analyses the properties of sequences and series (e.g., Fibonacci, arithmetic, geometric) and uses them to solve problems involving finite and infinite processes.
E. Understands how sequences and series are applied to solve problems in the mathematics of finance (e.g., simple, compound and continuous interest rates; annuities).
COMPETENCY 005
THE TEACHER UNDERSTANDS ATTRIBUTES OF FUNCTIONS, RELATIONS AND THEIR GRAPHS.

The beginning teacher:

A. Understands when a relation is a function.

B. Identifies the mathematical domain and range of functions and relations and determines reasonable domains for given situations.

C. Understands that a function represents a dependence of one quantity on another and can be represented in a variety of ways (e.g., concrete models, tables, graphs, diagrams, verbal descriptions, symbols).

D. Identifies and analyzes even and odd functions, one-to-one functions, inverse functions and their graphs.

E. Applies basic transformations [e.g., $k f(x), f(x) + k, f(x-k), f(kx), |f(x)|$] to a parent function, $f$, and describes the effects on the graph of $y = f(x)$.

F. Performs operations (e.g., sum, difference, composition) on functions, finds inverse relations and describes results symbolically and graphically.

G. Uses graphs of functions to formulate conjectures of identities [e.g., $y = x^2 - 1$ and $y = (x - 1)(x + 1)$, $y = \log x^3$ and $y = 3 \log x$, $y = \sin \left( x + \frac{\pi}{2} \right)$ and $y = \cos x$].

COMPETENCY 006
THE TEACHER UNDERSTANDS LINEAR AND QUADRATIC FUNCTIONS, ANALYZES THEIR ALGEBRAIC AND GRAPHICAL PROPERTIES AND USES THEM TO MODEL AND SOLVE PROBLEMS.

The beginning teacher:

A. Understands the concept of slope as a rate of change and interprets the meaning of slope and intercept in a variety of situations.

B. Writes equations of lines given various characteristics (e.g., two points, a point and slope, slope and y-intercept).

C. Applies techniques of linear and matrix algebra to represent and solve problems involving linear systems.

D. Analyzes the zeros (real and complex) of quadratic functions.

E. Makes connections between the $y = ax^2 + bx + c$ and the $y = a(x-h)^2 + k$ representations of a quadratic function and its graph.

F. Solves problems involving quadratic functions using a variety of methods (e.g., factoring, completing the square, using the quadratic formula, using a graphing calculator).

G. Models and solves problems involving linear and quadratic equations and inequalities using a variety of methods, including technology.
COMPETENCY 007
THE TEACHER UNDERSTANDS POLYNOMIAL, RATIONAL, RADICAL, ABSOLUTE VALUE AND PIECEWISE FUNCTIONS, ANALyzES THEIR ALGEBRAIC AND GRAPHICAL PROPERTIES AND USES THEM TO MODEL AND SOLVE PROBLEMS.

The beginning teacher:
A. Recognizes and translates among various representations (e.g., written, tabular, graphical, algebraic) of polynomial, rational, radical, absolute value and piecewise functions.
B. Describes restrictions on the domains and ranges of polynomial, rational, radical, absolute value and piecewise functions.
C. Makes and uses connections among the significant points (e.g., zeros, local extrema, points where a function is not continuous or not differentiable) of a function, the graph of the function and the function’s symbolic representation.
D. Analyzes functions in terms of vertical, horizontal and slant asymptotes.
E. Analyzes and applies the relationship between inverse variation and rational functions.
F. Solves equations and inequalities involving polynomial, rational, radical, absolute value and piecewise functions using a variety of methods (e.g., tables, algebraic methods, graphs, use of a graphing calculator) and evaluates the reasonableness of solutions.
G. Models situations using polynomial, rational, radical, absolute value and piecewise functions and solves problems using a variety of methods, including technology.
COMPETENCY 008
THE TEACHER UNDERSTANDS EXPONENTIAL AND LOGARITHMIC FUNCTIONS, ANALYZES THEIR ALGEBRAIC AND GRAPHICAL PROPERTIES AND USES THEM TO MODEL AND SOLVE PROBLEMS.

The beginning teacher:

A. Recognizes and translates among various representations (e.g., written, numerical, tabular, graphical, algebraic) of exponential and logarithmic functions.

B. Recognizes and uses connections among significant characteristics (e.g., intercepts, asymptotes) of a function involving exponential or logarithmic expressions, the graph of the function and the function’s symbolic representation.

C. Understands the relationship between exponential and logarithmic functions and uses the laws and properties of exponents and logarithms to simplify expressions and solve problems.

D. Uses a variety of representations and techniques (e.g., numerical methods, tables, graphs, analytic techniques, graphing calculators) to solve equations, inequalities and systems involving exponential and logarithmic functions.

E. Models and solves problems involving exponential growth and decay.

F. Uses logarithmic scales (e.g., Richter, decibel) to describe phenomena and solve problems.

G. Uses exponential and logarithmic functions to model and solve problems involving the mathematics of finance (e.g., compound interest).

H. Uses the exponential function to model situations and solve problems in which the rate of change of a quantity is proportional to the current amount of the quantity [i.e., \( f'(x) = k f(x) \)].
COMPETENCY 009
THE TEACHER UNDERSTANDS TRIGONOMETRIC AND CIRCULAR FUNCTIONS, ANALYZES THEIR ALGEBRAIC AND GRAPHICAL PROPERTIES AND USES THEM TO MODEL AND SOLVE PROBLEMS.

The beginning teacher:

A. Analyzes the relationships among the unit circle in the coordinate plane, circular functions and the trigonometric functions.

B. Recognizes and translates among various representations (e.g., written, numerical, tabular, graphical, algebraic) of trigonometric functions and their inverses.

C. Recognizes and uses connections among significant properties (e.g., zeros, axes of symmetry, local extrema) and characteristics (e.g., amplitude, frequency, phase shift) of a trigonometric function, the graph of the function and the function’s symbolic representation.

D. Understands the relationships between trigonometric functions and their inverses and uses these relationships to solve problems.

E. Uses trigonometric identities to simplify expressions and solve equations.

F. Models and solves a variety of problems (e.g., analyzing periodic phenomena) using trigonometric functions.

G. Uses graphing calculators to analyze and solve problems involving trigonometric functions.

COMPETENCY 010
THE TEACHER UNDERSTANDS AND SOLVES PROBLEMS USING DIFFERENTIAL AND INTEGRAL CALCULUS.

The beginning teacher:

A. Understands the concept of limit and the relationship between limits and continuity.

B. Relates the concept of average rate of change to the slope of the secant line and relates the concept of instantaneous rate of change to the slope of the tangent line.

C. Uses the first and second derivatives to analyze the graph of a function (e.g., local extrema, concavity, points of inflection).

D. Understands and applies the fundamental theorem of calculus and the relationship between differentiation and integration.

E. Models and solves a variety of problems (e.g., velocity, acceleration, optimization, related rates, work, center of mass) using differential and integral calculus.

F. Analyzes how technology can be used to solve problems and illustrate concepts involving differential and integral calculus.
DOMAIN III — GEOMETRY AND MEASUREMENT

COMPETENCY 011
THE TEACHER UNDERSTANDS MEASUREMENT AS A PROCESS.

The beginning teacher:

A. Applies dimensional analysis to derive units and formulas in a variety of situations (e.g., rates of change of one variable with respect to another) and to find and evaluate solutions to problems.

B. Applies formulas for perimeter, area, surface area and volume of geometric figures and shapes (e.g., polygons, pyramids, prisms, cylinders, cones, spheres) to solve problems.

C. Recognizes the effects on length, area or volume when the linear dimensions of plane figures or solids are changed.

D. Applies the Pythagorean theorem, proportional reasoning and right triangle trigonometry to solve measurement problems.

E. Relates the concept of area under a curve to the limit of a Riemann sum.

F. Uses integral calculus to compute various measurements associated with curves and regions (e.g., area, arc length) in the plane, and measurements associated with curves, surfaces and regions in three-space.

COMPETENCY 012
THE TEACHER UNDERSTANDS GEOMETRIES, IN PARTICULAR EUCLIDEAN GEOMETRY, AS AXIOMATIC SYSTEMS.

The beginning teacher:

A. Understands axiomatic systems and their components (e.g., undefined terms, defined terms, theorems, examples, counterexamples).

B. Uses properties of points, lines, planes, angles, lengths and distances to solve problems.

C. Applies the properties of parallel and perpendicular lines to solve problems.

D. Uses properties of congruence and similarity to explore geometric relationships, justify conjectures and prove theorems.

E. Describes and justifies geometric constructions made using compass and straightedge, reflection devices and other appropriate technologies.

F. Demonstrates an understanding of the use of appropriate software to explore attributes of geometric figures and to make and evaluate conjectures about geometric relationships.

G. Compares and contrasts the axioms of Euclidean geometry with those of non-Euclidean geometry (i.e., hyperbolic and elliptic geometry).
COMPETENCY 013
THE TEACHER UNDERSTANDS THE RESULTS, USES AND APPLICATIONS OF EUCLIDEAN GEOMETRY.

The beginning teacher:
A. Analyzes the properties of polygons and their components.
B. Analyzes the properties of circles and the lines that intersect them.
C. Uses geometric patterns and properties (e.g., similarity, congruence) to make generalizations about two- and three-dimensional figures and shapes (e.g., relationships of sides, angles).
D. Computes the perimeter, area and volume of figures and shapes created by subdividing and combining other figures and shapes (e.g., arc length, area of sectors).
E. Analyzes cross-sections and nets of three-dimensional shapes.
F. Uses top, front, side and corner views of three-dimensional shapes to create complete representations and solve problems.
G. Applies properties of two- and three-dimensional shapes to solve problems across the curriculum and in everyday life.

COMPETENCY 014
THE TEACHER UNDERSTANDS COORDINATE, TRANSFORMATIONAL AND VECTOR GEOMETRY AND THEIR CONNECTIONS.

The beginning teacher:
A. Identifies transformations (i.e., reflections, translations, glide-reflections, rotations, dilations) and explores their properties.
B. Uses the properties of transformations and their compositions to solve problems.
C. Uses transformations to explore and describe reflectional, rotational and translational symmetry.
D. Applies transformations in the coordinate plane.
E. Applies concepts and properties of slope, midpoint, parallelism, perpendicularity and distance to explore properties of geometric figures and solve problems in the coordinate plane.
F. Uses coordinate geometry to derive and explore the equations, properties and applications of conic sections (i.e., lines, circles, hyperbolas, ellipses, parabolas).
G. Relates geometry and algebra by representing transformations as matrices and uses this relationship to solve problems.
H. Explores the relationship between geometric and algebraic representations of vectors and uses this relationship to solve problems.
COMPETENCY 016
THE TEACHER UNDERSTANDS CONCEPTS AND APPLICATIONS OF PROBABILITY.

The beginning teacher:

A. Understands how to explore concepts of probability through sampling, experiments and simulations and generates and uses probability models to represent situations.
B. Uses the concepts and principles of probability to describe the outcomes of simple and compound events.
C. Determines probabilities by constructing sample spaces to model situations.
D. Solves a variety of probability problems using combinations and permutations.
E. Solves a variety of probability problems using ratios of areas of geometric regions.
F. Calculates probabilities using the axioms of probability and related theorems and concepts such as the addition rule, multiplication rule, conditional probability and independence.

G. Understands expected value, variance and standard deviation of probability distributions (e.g., binomial, geometric, uniform, normal).
H. Applies concepts and properties of discrete and continuous random variables to model and solve a variety of problems involving probability and probability distributions (e.g., binomial, geometric, uniform, normal).

COMPETENCY 017
THE TEACHER UNDERSTANDS THE RELATIONSHIPS AMONG PROBABILITY THEORY, SAMPLING AND STATISTICAL INFERENCE AND HOW STATISTICAL INFERENCE IS USED IN MAKING AND EVALUATING PREDICTIONS.

The beginning teacher:

A. Applies knowledge of designing, conducting, analyzing and interpreting statistical experiments to investigate real-world problems.
B. Analyzes and interprets statistical information (e.g., the results of polls and surveys) and recognizes misleading as well as valid uses of statistics.
C. Understands random samples and sample statistics (e.g., the relationship between sample size and confidence intervals, biased or unbiased estimators).
D. Makes inferences about a population using binomial, normal and geometric distributions.
E. Describes and analyzes bivariate data using various techniques (e.g., scatterplots, regression lines, outliers, residual analysis, correlation coefficients).
F. Understands how to transform nonlinear data into linear form in order to apply linear regression techniques to develop exponential, logarithmic and power regression models.
G. Uses the law of large numbers and the central limit theorem in the process of statistical inference.
H. Estimates parameters (e.g., population mean and variance) using point estimators (e.g., sample mean and variance).
I. Understands principles of hypotheses testing.
DOMAIN V — MATHEMATICAL PROCESSES AND PERSPECTIVES

COMPETENCY 018
THE TEACHER UNDERSTANDS MATHEMATICAL REASONING AND PROBLEM SOLVING.

The beginning teacher:
A. Understands the nature of proof, including indirect proof, in mathematics.
B. Applies correct mathematical reasoning to derive valid conclusions from a set of premises.
C. Uses inductive reasoning to make conjectures and uses deductive methods to evaluate the validity of conjectures.
D. Uses formal and informal reasoning to justify mathematical ideas.
E. Understands the problem-solving process (i.e., recognizing that a mathematical problem can be solved in a variety of ways, selecting an appropriate strategy, evaluating the reasonableness of a solution).
F. Evaluates how well a mathematical model represents a real-world situation.

COMPETENCY 019
THE TEACHER UNDERSTANDS MATHEMATICAL CONNECTIONS BOTH WITHIN AND OUTSIDE OF MATHEMATICS AND HOW TO COMMUNICATE MATHEMATICAL IDEAS AND CONCEPTS.

The beginning teacher:
A. Recognizes and uses multiple representations of a mathematical concept (e.g., a point and its coordinates, the area of a circle as a quadratic function of the radius, probability as the ratio of two areas, area of a plane region as a definite integral).
B. Understands how mathematics is used to model and solve problems in other disciplines (e.g., art, music, science, social science, business).
C. Translates mathematical ideas between verbal and symbolic forms.
D. Communicates mathematical ideas using a variety of representations (e.g., numeric, verbal, graphical, pictorial, symbolic, concrete).
E. Understands the use of visual media, such as graphs, tables, diagrams and animations, to communicate mathematical information.
F. Uses appropriate mathematical terminology to express mathematical ideas.
DOMAIN VI — MATHEMATICAL LEARNING, INSTRUCTION AND ASSESSMENT

COMPETENCY 020
THE TEACHER UNDERSTANDS HOW CHILDREN LEARN MATHEMATICS AND PLANS, ORGANIZES AND IMPLEMENTS INSTRUCTION USING KNOWLEDGE OF STUDENTS, SUBJECT MATTER AND STATEWIDE CURRICULUM (TEXAS ESSENTIAL KNOWLEDGE AND SKILLS [TEKS]).

The beginning teacher:
A. Applies research-based theories of learning mathematics to plan appropriate instructional activities for all students.
B. Understands how students differ in their approaches to learning mathematics.
C. Uses students’ prior mathematical knowledge to build conceptual links to new knowledge and plans instruction that builds on students’ strengths and addresses students’ needs.
D. Understands how learning may be enhanced through the use of manipulatives, technology and other tools (e.g., stop watches, scales, rulers).
E. Understands how to provide instruction along a continuum from concrete to abstract.
F. Understands a variety of instructional strategies and tasks that promote students’ abilities to do the mathematics described in the TEKS.
G. Understands how to create a learning environment that provides all students, including English-language learners, with opportunities to develop and improve mathematical skills and procedures.
H. Understands a variety of questioning strategies to encourage mathematical discourse and to help students analyze and evaluate their mathematical thinking.
I. Understands how to relate mathematics to students’ lives and to a variety of careers and professions.

COMPETENCY 021
THE TEACHER UNDERSTANDS ASSESSMENT AND USES A VARIETY OF FORMAL AND INFORMAL ASSESSMENT TECHNIQUES TO MONITOR AND GUIDE MATHEMATICS INSTRUCTION AND TO EVALUATE STUDENT PROGRESS.

The beginning teacher:
A. Understands the purpose, characteristics and uses of various assessments in mathematics, including formative and summative assessments.
B. Understands how to select and develop assessments that are consistent with what is taught and how it is taught.
C. Understands how to develop a variety of assessments and scoring procedures consisting of worthwhile tasks that assess mathematical understanding, common misconceptions and error patterns.
D. Understands the relationship between assessment and instruction and knows how to evaluate assessment results to design, monitor and modify instruction to improve mathematical learning for all students, including English-language learners.