

EDUC 287A - Secondary Math Methods I

Term: Fall 2024

Credits: 3 units

Course Day & Times: Tuesday 5-8pm

Location: GH 20X

Instructor Information

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Course Description

EDUC 287A (Secondary Math Methods I) is part one of a two-course sequence in secondary mathematics teaching methods. This sequence is designed to provide teacher candidates with a coherent set of experiences for mathematics teaching and learning in secondary schools. This course focuses on how mathematics teachers can support all students to view themselves as mathematically competent. This course will support teacher candidates to implement equity-based mathematics teaching strategies, to teach for mathematical sense making and a growth mindset, and to support diverse learners. Through thinking about ourselves as mathematics teachers and learners, examining mathematics classroom culture and structures, facilitating rich mathematical tasks in our placements, and assessing student work, this course will set the stage for our development as secondary mathematics teachers.

Respect for Diversity

It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength, and benefit. It is my intent to present materials and activities that are respectful of diverse identities (e.g., those based on gender, sexuality, disability, age, socioeconomic status, ethnicity, race, religion, and culture). Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.

Land Acknowledgment

Santa Clara University occupies the unceded ancestral homeland of the Ohlone and Muwekma Ohlone people.

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Mission and Goals of the Department of Education

Rooted in the Jesuit tradition at Santa Clara University, the mission of the Department of Education is to prepare professionals of competence, conscience, and compassion who will promote the common good as they transform lives, schools, and communities. Our core values of reflective practice, scholarship, diversity, ethical conduct, social justice, and collaboration guide both theory and practice.

Faculty, staff, and students in the Department of Education:

1. Make student learning our central focus
2. Engage continuously in reflective and scholarly practice
3. Value diversity
4. Become leaders who model ethical conduct and a commitment to social justice
5. Seek collaboration with others in reaching these goals

MATTC Program Learning Goals (PLGs)

The PLGs represent SCU's Masters of Arts in Teaching and Teaching Credential (MATTC) program's commitment to individuals who earn their multiple or single subjects credential at Santa Clara University. The MATTC faculty focus on ensuring each student will begin their teaching career ready to:

1. Engage and Support All Students in Learning.
2. Create productive, supportive learning environments.
3. Teach for student understanding.
4. Make evidence-based instructional decisions informed by student assessment data.
5. Improve their practice through critical reflection and collaboration.
6. Apply moral and ethical principles in their professional practices.
- 7.

The PLGs guide our program. Therefore, all MS/SS teaching credential program course objectives are cross-referenced with the PLGs. (A fully elaborated version of the MS/SS PLGs can be found in the Teacher Candidate Handbook, Pre-Service Pathway.)

Course Objectives

This course will develop students' knowledge of or skills related to:		Goals/Standards Addressed			
		DG #	PLG #	TPE #	MMSN TPE #
1	<i>Examining knowledge, beliefs, and assumptions about mathematics, teaching, and students</i> , with particular attention to the impact language, culture, socio-economic status, and identified disabilities have had on mathematical learning opportunities.	2	5,6	2.2, 2.5, 2.6, 4.7	
2	Increasing knowledge of mathematics <i>content</i> and <i>pedagogical content knowledge</i> .	1	1	1.3, 1.5, 1.8, 3.1	
3	Increasing theoretical knowledge and practical experience in <i>planning, teaching</i> , and <i>assessing</i> mathematics learning, with	1,3	1,3,4	1.3, 1.5, 1.8, 3.1,	

	particular attention for how to <i>modify</i> teaching to meet the needs of diverse learners while maintaining the <i>cognitive demand</i> of tasks.			4.7, 5.3, 5.5	
4	Understanding the mathematical needs of a diverse range of students and adopting an <i>asset-based view</i> of students and families, particularly from populations that have traditionally been positioned as low <i>status</i> in mathematics classrooms.	1,3	1,2,3	2.2, 2.5	
5	Understanding the complexities of diverse, multiple-ability classrooms while broadening your repertoire of teaching techniques to <i>engage</i> all students, including students with identified disabilities, in rich, complex, and multi-dimensional mathematics.	2,5	1,2	1.3, 1.5, 1.8, 2.5, 2.6, 3.1, 4.7, 5.3, 5.5	
6	Learning from experiences in schools through informed reflection.	2,4	5	6.1	
*DG=Department Goals; PLG =Program Learning Goal; TPE =Teaching Performance Expectation Standard; MMSN TPE =Mild Moderate TPEs					

Required Resources

[add text here...]

Graded Assignments

Assignment Title	Due Date	Points or %	TPEs Addressed	MMSN TPEs Addressed
1. Math Autobiography	Mon 9/23	10	6.1	
2. Number Talk	Mon 11/4	60	1.3, 1.5, 1.8, 2.2, 2.5, 2.6, 4.7, 6.1	
3. Analysis of Teaching	Fri 12/6	30	1.8, 2.2, 2.5, 2.6,	

			3.1, 4.7, 5.5, 6.1	
4. End of Course Reflection	Fri 12/13	10	2.2, 6.1	
5. Smaller weekly assignments*	Varied	20		

* These weekly assignments vary by week and can include assignments such as reading reflections, discussion posts, watching and commenting on videos, annotating documents, and evaluating/designing math tasks.

Note: Descriptions and rubrics for major course assignments can be found on Camino.

Grading Criteria

1. All written and oral assignments must reflect graduate-level standards. As a future teacher, you must be able to model communication skills for your students.
2. Attendance and participation in all class meetings is required. If you are going to be absent from class, you must notify the instructor of your absence. You will still be responsible for all missed content and in-class work (see Attendance Policy below for more details).
3. Letter grades are assigned on the standard scale based upon a possible total of 100 points or 100%..

A	94-100	C+	77-79
A-	90-93	C	74-76
B+	87-89	C-	70-73
B	84-86	D+	67-69
B-	80-83	D	63-66

4. For assignments done in groups, all group members will receive the same grade, unless otherwise stated.
5. Final grades will reflect students' contributions (e.g., attendance, class discussions, quality of presentation, ability to lead discussion groups, completion and quality of course assignments), critical thinking and ability/degree to which student integrates theory, research and practice.
6. All assignments are expected to be submitted on their due dates. Unless we have made special arrangements beforehand, late assignments will be docked 5% for each day past the due date that they are submitted.

Course Outline

Week (Date)	Topic	Readings & Relevant Activities	Assignments
1 9/24	Introduction: Teaching and Learning Math for Equity and Access	<ul style="list-style-type: none"> • TODOS. (2020). Centering Our Humanity: Addressing Social and Emotional Needs in Schools and Mathematics Classrooms. • TODOS. (2020). The mo(ve)ment to prioritize antiracist mathematics: Planning for this and every school year [Position statement]. 	Assignment: Math Autobiography
2 10/1	What is mathematical proficiency? Norms to support mathematical proficiency	<ul style="list-style-type: none"> • Kilpatrick, J., Swafford, J., & Findell, B. (Eds.). (2001). <i>Adding it up: Helping children learn mathematics</i>. Read Selected pages (115-135). • Common Core Standards for Mathematical Practice (2010). (pp. 6-8) 	DUE Monday 9/30: Math Autobiography
3 10/8	Listening to Student Thinking	<ul style="list-style-type: none"> • Skinner, Louie, Baldinger. (2019). Learning to see students' mathematical strengths. • Schifter, D. (2001). Learning to see the invisible. What skills and knowledge are needed in order to engage with students' mathematical ideas? In T. Wood & B. Scott Nelson & J. Warfield (Eds.), <i>Beyond classical pedagogy: Teaching elementary mathematics</i>. Mahwah, NJ: Lawrence Erlbaum Associates (pp. 109-134). 	
4 10/15	Exploring Number Sense and Number Talks	<ul style="list-style-type: none"> • Boaler, J. (2015). Fluency without fear. • Reinhart, S. (2000). Never say anything a kid can say! <i>Mathematics teaching in the middle school</i>, 5(8), 478. 	Assignment: Number Talk

5 (Asynchronous) 10/22	Teaching in Diverse Classrooms Part 1 - ELs & “Creative Insubordination”	<ul style="list-style-type: none"> • Moschkovich, J. (2013). Principles and Guidelines for Equitable Mathematics Teaching Practices and Materials for English Language Learners. • Gutierrez. (2016). Strategies for Creative Insubordination 	
6 10/29	Teaching in Diverse Classrooms Part 2 - Status Competence & Dis/ability	<ul style="list-style-type: none"> • Universal Design Framework: https://udlguidelines.cast.org/ • Boaler & LaMar (2019). https://time.com/5539300/learning-disabilities-special-education-math-teachers-parents-students/ • Hunt, J.H., & Andreasen, J.A. (2011). Beyond accommodations: Universal design for learning in mathematics. <i>Mathematics Teaching in the Middle School</i>, 17(3),166-173. <p>Optional: Cohen, E. & Lotan, R. (1999). Complex instruction: Equity in cooperative learning classrooms.</p>	
7 (Asynchronous) 11/5	Teaching in Diverse Classrooms Part 3 – Dis/ability & Culturally relevant math teaching	<ul style="list-style-type: none"> • Jones, S. (2016). Culturally Relevant Pedagogy in Mathematics: A Critical Need. TedX Talk. • Allen, K. & Schnell, K. (2016). Developing mathematical identities. <i>Mathematics Teaching in the Middle Schools</i>. 21(7). 398-405. 	
8	Big Ideas and Learning Objectives	<ul style="list-style-type: none"> • Black, P., Harrison, C. Lee, C., Marshall, B. & Wiliam, D. (2004). Working inside the black 	DUE Monday 11/4: Number Talk

11/12	What is formative assessment? Part 1	<p>box: Assessment for learning in the classroom.</p> <p>OPTIONAL: Wiggins, G. P., & McTighe, J. (2005). Understanding by Design. Introduction and Ch 1.</p>	<p>Assignment Final Write Up</p> <p>Assignment: Analysis of Teaching</p>
9 (Asynchronous) 11/19	What is formative assessment? Part 2	<ul style="list-style-type: none"> Herbel-Eisenmann & Breyfoyle – Questioning our pattern of questioning (2005) 	
10 12/3	Selecting and Modifying Tasks	<ul style="list-style-type: none"> Stein, M. K., Smith, M. S., Henningsen, M. A., & Silver, E. (2000). Implementing standards-based mathematics instruction. (Cognitive Demand) Introduction and Ch 1&2. 	<p>DUE Friday 12/13– Analysis of Teaching Assignment Final</p>

Professional Conduct Expectations

Attendance & Punctuality

Regular attendance at all class meetings is a requirement in this program. Ten percent will be deducted from your final grade for the course for each unexcused class session you missed. Each student will be granted one Emergency Release (ER) per course. Your ER excuses you from one class session. To use your ER you must notify the instructor by email or phone BEFORE class. Save your ER for medical issues, family demands, car trouble, etc.

Students will not be penalized for absences due to the observance of religious holidays that fall on our scheduled class day; please give the instructor advance notice of these absences so they can make the necessary accommodations.

Coming to class (and returning from breaks) on time is another course requirement. Your first unexcused lateness will have no consequences, and subsequent unexcused lateness may result in a 1% reduction in overall grade for each instance.

Note: Points lost due to poor attendance and/or lack of punctuality will be deducted from your final grade. A student with excellent grades on assignments and other aspects of professional conduct can earn a poor course grade as a result of excessive absence or chronic tardiness.

Participation

Your participation in whole class discussions and group work is essential for the success of this course. We, as educators committed to equitable education, will engage in respectful, thoughtful participation in class activities and discussion. To fully participate in the course activities, the assignments must be completed before the class session in which they are due. The quality of our class sessions and the depth of your learning depend directly on your prepared participation.

While class is in session, you should not engage in any activity not directly related to what is taking place in the classroom. Instructors reserve the right to ask you to close your laptop or put away some other form of technology at their discretion; when/if this occurs, please respond quickly and without protest to avoid further disruption of the class's learning. Instructors also reserve the right to ignore your inappropriate use of technology in class and simply deduct points from your final grade. If you would like more detailed clarification about the expectations regarding appropriate and inappropriate in-class technology use, please feel free to contact your instructor for further information.

Communication

Email using our SCU email address will be our primary means of communication outside of class. You must check your SCU email and our course's Camino site every day to ensure you maintain a connection with the course content, your classmates, and your instructor.

Academic Integrity

The Academic Integrity pledge is an expression of the University's commitment to fostering an understanding of— and commitment to—a culture of integrity at Santa Clara University. The Academic Integrity pledge, which applies to all students, states:

I am committed to being a person of integrity. I pledge, as a member of the Santa Clara University community, to abide by and uphold the standards of academic integrity contained in the Student Conduct Code.

Academic integrity is part of your intellectual, ethical, and professional development. I expect you to uphold the principles of this pledge for all work in this class. I will clarify expectations on academic integrity -- including the use of AI tools such as ChatGPT and course sharing sites for all assignments and exams in this course. If you have questions about what is appropriate on any assignment, please let me know before you hand in work. For more resources about ensuring academic integrity in your work, see this [LibGuide on Academic Integrity](#).

If an instructor has reason to feel you are not meeting all the expectations as outlined in the syllabus, they will contact you privately to discuss the issue, to clarify the expectations as needed, and to offer their support in helping you reach those expectations. If your instructor does not contact you with a concern, you can assume you are satisfying these requirements. However, if you would like specific feedback on your professional conduct during the quarter, you are welcome to contact your instructor at any time and s/he will be glad to share their assessment with you.

Policies, Accommodations, & Supports

Discrimination, Harassment, and Sexual Misconduct (Title IX)

Santa Clara University is committed to providing all students with a safe learning environment free of all forms of discrimination, sexual harassment, and sexual violence.

Please know that as a faculty member, California law SB 493 requires me to report any information brought to my attention about incidents of sexual harassment or misconduct to the SCU [Equal Opportunity and Title IX Office](#) (408) 551-3043. This includes, but is not limited to, disclosures in writing assignments, class discussions, and one-on-one conversations.

Should you need support, SCU has dedicated staff trained to assist you in navigating campus resources, accessing health and counseling services, providing academic and housing accommodations, helping with legal protective orders, and filing a formal complaint with the University or with law enforcement. Please see the [Student Resources](#) page for more information about reporting options and resources.

If you or someone you know has experienced sexual harassment or sexual violence and wishes to speak to a confidential resource who is not required to report, please contact one of the following SCU resources for support:

- [SCU Wellness Center](#)
- [CAPS](#)

- Any individual (clergy, counselors) acting in a professional capacity for which confidentiality is mandated by law

I am happy to help connect you with any of these resources.

Accommodations for Pregnant and Parenting Students

Santa Clara University does not discriminate against any student on the basis of pregnancy or related medical conditions. Absences due to medical conditions relating to pregnancy and childbirth will be excused for as long as deemed medically necessary by a student's doctor, and students will be given the opportunity to make up missed work. Students needing accommodations can often arrange accommodations by working directly with their instructors, supervisors, or departments. Students needing accommodations can also seek assistance with accommodations from the Office of Accessible Education (OAE) or from the Office of Equal Opportunity and [Title IX Office](#). This [resource page](#) from Title IX provides information for students and faculty regarding pregnancy rights.

Office of Accessible Education

If you have a documented disability for which accommodations may be required in this class, please contact the Office of Accessible Education oae@scu.edu, <https://www.scu.edu/oae> as soon as possible to discuss your needs and register for accommodations with the University. If you have already arranged accommodations through OAE, please be sure to request your accommodations through your my OAE portal and discuss them with me during my office hours within the first two weeks of class. To ensure fairness and consistency, individual faculty members are required to receive verification from the Office of Accessible Education before providing accommodations. OAE will work with students and faculty to arrange proctored exams for students whose accommodations include double time for exams and/or assistive technology.

Students with approved accommodations of time and a half should talk with me as soon as possible. The Office of Accessible Education must be contacted in advance (at least two weeks' notice recommended) to schedule proctored examinations or to arrange other accommodations.

In light of shifting health advisories related to COVID-19, exams may be administered online. Students with approved testing accommodations should contact me (at least two weeks' notice recommended) prior to the exam date to notify me of their intent to use their testing accommodations on the upcoming exam to ensure their accommodations are effectively implemented.

Safety Measures

In order to meet our learning objectives, we will adhere to the highest standards for safety and mutual respect. University policy allows faculty to require the use of face coverings in their classrooms. I may request that students wear face coverings occasionally or throughout the academic term. Failure to comply with my request is a violation of the [Student Conduct Code](#), which I will need to report.

Use of Classroom Recordings

All online class meetings will be recorded and made available on Camino. As is stated in the [Student Conduct Code](#): “...Dissemination or sharing of any classroom recording without the permission of the instructor would be considered “misuse” and, therefore, prohibited. Violations of these policies may result in disciplinary action by the University. At the instructor’s discretion, violations may also have an adverse effect on the student’s grade.”

Copyright Statement

Materials in this course are protected by the United States copyright laws. I am the copyright holder of the materials I create, including notes, handouts, slides, and videos. You may make copies of course materials for your own use and you may share the materials with other students enrolled in this course. You may not publicly distribute the course materials without my written permission.

Technology Support

Course materials and online activities will be available on SCU’s Canvas learning management system (also known as Camino). Course reminders, readings, and assignments will be available through Camino. SCU can provide you with technical assistance, and you can also reach out to our providers directly for questions. For Camino support, contact caminosupport@scu.edu or call 408-551-3572.

You can also find support resources via the help button within the Camino platform (on the left-hand navigation) to access after-hours support via email, chat, or phone.

For Zoom assistance, contact Media Services at mediaservices@scu.edu or 408-554-4520. You can also get support from the [SCU website](#) or the [Zoom Help Center](#) website.

For SCU network and computing support, contact the SCU Technology Help Desk at techdesk@scu.edu or 408-554-5700. They can provide support for MySCU Portal, Eduroam, Duo, hardware and software issues, and more.

In addition to the required syllabus statements above, statements addressing diversity, equity and inclusion, and student wellness such as those below are strongly recommended.

Wellness

I know you will do the best you can in this class (and all of your classes); however, it should never be at the expense of your own mental and physical health and your overall well-being. Jesuit education is grounded in *cura personalis*, concern for the whole person—mind, body, and spirit. What does this mean for you? Be kind to others, and more importantly, be kind to yourself. Attend to your sleep (quantity and quality); drink lots of water; move; get outside; and pay attention to beauty that isn’t coming to you on a screen. Eat good food, laugh, enjoy friends and family, look for opportunities to connect with others in new ways, pray, meditate, or otherwise attend to your spirit. And ask for help, even if you don’t think you need it. Lots of folks, including me, are here to support you. It’s never too late to reach out, and I am committed to helping you.

SCU has many resources and programs to support you. These resources may be especially helpful:

Wellness Center

The Wellness center (<https://www.scu.edu/wellness>) provides resources to aid and promote student well-being across the eight dimensions of wellness, including student peer groups for healthful living, violence prevention, and recovery.

CAPS

Santa Clara students are provided confidential counseling sessions at no cost through Counseling and Psychological Services (CAPS; <https://www.scu.edu/cowell/counseling-and-psychological-services-caps/>). Students have access to clinically appropriate, short-term therapy; group therapy; and other resources for care. A new 24/7 support line is also available: 408-554-5220.

SCU Culture of Care

If you are concerned for the mental or physical welfare of one of your peers, the [Office of Student Life Culture of Care](#) website provides resources for recognizing and helping someone in distress.

Academic Concerns

If you are concerned with your progress in this class, please contact me so that we can find solutions together. [Drahmann Center](#) can also offer support with issues regarding your academic progress more broadly.

SCU also has multiple options for free academic tutoring. Students can make appointments to discuss work in a range of courses:

- [Drahmann Tutoring](#) (for many courses in the College of Arts & Sciences including Natural Sciences, Modern Languages, Economics, and Computer Science)
- [The HUB Writing Center](#) (Writing and Public Speaking)

Gender Inclusive Language

This course affirms people of all gender expressions and gender identities. If you go by a name different from what is on the class roster, please let me know. Using correct gender pronouns is important to me, so I encourage you to share your pronouns with me and correct me if I make a mistake. If you have any questions or concerns, please do not hesitate to contact me. For more on personal pronouns see www.mypronouns.org

Evidence for CTC*

*Note: this section of the syllabus should not be shared with your students.

Description: All Assessment (A) for CTC will be under the [Course Assignments -Details](#) section below. For any Introduce (I) or Practice (P), please provide evidence below, such as a reading discussion slide for Introduce or directions for more applications based activity for Practice.

TITLE: PRACTICE TPE: 5.3 - Practice Creating Self-Assessment After a discussion on assessment for learning and the benefits of self-assessment, in groups teacher candidates will co-design a self-assessment based on a math task. The self-assessment is aligned to the learning goals. Once the self-assessment is complete, teacher candidates will discuss how self-assessment feedback can support students to identify strategies to “move up” in the rubric.

Sample of Self-Assessment - In groups complete the remaining elements of the self-assessment

Learning Goals	1	2	3	4
Solve a system of linear equations.	I can not set up a system of equations to solve.			I can set up and solve the system of equation correctly all of the time.
Explain the meaning of a solution to an equation or system of equations.	I do not know what the solution means.			

TITLE. Analysis of Teaching Assignment. (Assignment details below): In this assignment candidates will analyze their teaching to understand how they engage students in higher order mathematical thinking and how they support diverse learners (see below for assignment details).

The following TPEs are addressed in this assignment:

PRACTICE TPEs:

- **1.5:** In this assignment teacher candidates analyze the rigor of student engagement through a detailed analysis of the types of questions teacher candidates ask their students.
- **3.1** In this assignment students must write clear learning goals and language goals that demonstrate knowledge of subject matter, including the adopted California State Standards and curriculum frameworks.
- **5.5** The final section of this assignment is for teacher candidates to use data gathered from formative questioning to determine and support students in next steps for learning.

- **6.1** Also in the final section of the assignment, teacher candidates must reflect on their instruction to determine next steps.

Analysis of Teaching Assignment and Write Up (25 points)

The purpose of this assignment is to conduct an in-depth analysis of your instruction, with particular attention to mathematical engagement and the types of questions and responses you are posing to your students. You will be asked to video record and analyze a minimum of 10 minutes of your instruction.

In relation to CalTPA Cycle 1, this assignment will help you address all 5 video annotations and support your reflection write up:

- Annotation 1: Creating a positive and safe learning environment
- Annotation 2: Explaining connections to prior learning and establishing expectations for content-specific learning
- Annotation 3: Engaging students in content-specific higher-order thinking
- Annotation 4: Monitoring for student understanding, and
- Annotation 5: Next steps for learning.

Prompt	Response
Background (2 point): 1. Name of the course 2. Content area/Math Topic	
Learning Goals/Objectives + ELD Goals/Objectives (4 points) What are the intended content learning goals or objectives of the lesson? (Be sure they set of learning goals is <i>assessable</i> and multi-dimensional.) What are the ELD goals of the lesson? (Be sure attend to productive and receptive modalities related to mathematical engagement.)	
Analyzing Mathematical Engagement (4 points): Provide evidence for: 1. Any strands of <i>mathematical proficiency</i> (procedural fluency, conceptual understanding, adaptive reasoning, strategic competence, productive disposition) that students engaged in during the video clips. 2. Any of the eight Common Core <i>Mathematical Practices</i> students engaged in during the lesson.	

<p>* See below for descriptions of mathematical proficiencies and mathematical practices.</p>	
<p>Teacher Questions & Responses (10 points):</p> <p>Listen carefully to at least 10 minutes of your instruction and <i>transcribe all of the questions</i> you asked your students. Include a copy of your transcribed questions. (4 points)</p> <p>You will then analyze your teacher questions (6 points):</p> <ol style="list-style-type: none"> 1. Classify the different types of questions that you asked as either: <ol style="list-style-type: none"> a. Funneling – Why don't you do ____ next? What did you get as the answer? b. Focusing/Eliciting – What did you do? How did you do ____? Can you explain your idea? Why did you ____? c. Extending – I wonder what would happen if _____? d. Other – does not fit into above category. 2. What patterns did you notice across the types of questions you asked? 	
<p>Reflection (5 points):</p> <p>In reflecting upon the teaching episode describe:</p> <ol style="list-style-type: none"> 1. Successes – What went well during the teaching episode? 2. Challenges – What was challenging during the teaching episode? 3. Next Steps + Changes – What might you do differently if you taught this lesson again? 	

TITLE. Number Talk Assignment. (Assignment details below) Number Talks are whole class mathematics discussions that support content as well foster a community in which students and teachers must share ideas to co-develop understanding of mathematical concepts.

PRACTICE TPEs:

- **1.3:** Through facilitating a mathematical activity called Number Talks, teacher candidates connect subject matter provide active learning experiences to engage student interest, support student motivation, and allow students to extend their learning. Through Number Talks, teachers must facilitate a whole class discussion to elicit multiple strategies to solve math problems.
- **1.5** Teacher candidates also support critical thinking by asking probing eliciting questions that support students conceptual understanding of mathematical procedures.
- **2.2** Number Talks also foster learning environments that promote productive student learning, encourage positive interactions among students, reflect diversity and multiple perspectives. **2.5** Number Talks also support teacher candidates to maintain high expectations for learning with appropriate support for the full range of students in the classroom, as well as **2.6** Establish and maintain clear expectations for positive classroom behavior and for student-to- student and student-to-teacher interactions by communicating classroom routines, procedures, and norms.
- **4.7** Number Talks support teacher candidates to plan instruction that promotes a range of communication strategies (e.g., verbal, visual representation, listening) and activity modes between teacher and student and among students that encourage student participation in learning.
-

Number Talk Assignment

What to do:

1. **Pick Problems & Dates to Implement:** Choose one dot card and two other problems you will do with your students. You must do the number to talk with a group that has *at least 5 students*. We would prefer that the number talks be done over *at least two sessions* in the same class. Be sure to *start with a dot card talk*. This will help establish norms and allow you to teach the students proper etiquette.

Below are some potential problems to do with your students. You can also make up your own problem. You know your grade level and students best, so pick a problem that is appropriate for your students from any of the grade levels. For example, if this is the first time your students have engaged in number talks, you may want to start with an addition problem that has lots of strategies.

Middle School	High School
---------------	-------------

Dot card*	Dot card*
56 – 19	Any middle school problem
123 + 79	1000 – 674
432 – 135	12 x 16
40% of 80	13pi/8 expressed as degrees
30% of 90	
8 x 15	
12 x 15 (good to do if students have several methods for 8x15)	
6 x 25 (good to do if students DON'T have several methods for 8x15)	

***NOTE:** Dot card is required. Print page from Camino. There is also a list of suggested Number Talk Problems in Camino

2. **Complete Planning Sheet:** Fill in one planning sheet (the one we used in class) for each problem in detail (legibly, please!)

- Anticipated student responses
- A list of possible questions you will use to probe student thinking
- Ways of recording solutions to reflect what the student is thinking
- How you will address issues that might arise

3. **Conduct the number talk:** With a small group of students or your entire class conduct the number talk. Be sure to introduce “silent thumbs” and record student strategies. **Take a picture** of the board for your records.

4. **Memo:** As soon as you do the number talk, write a quick “memo,” jotting down your thoughts and reactions. This is not a formal reflection – it is just a way to capture your thoughts immediately afterwards.

5. **Write-Up* (6-8 pages, double spaced):** Write a formal reflection of your number talk. Be sure to address the following questions:

a. **Planning:**

- i. Why did you pick the particular problems?
- ii. What misconceptions did you anticipate students would have?
- iii. How will you support English Learners and students with identified disabilities?

b. **During:**

- i. What happened during the number talks?
- ii. What worked well during the number?
- iii. What was challenging during the number talk?
- iv. What surprised you during the number talk?

c. **Student Thinking – Analyze for each number talk problem:**

- i. What strategies did students use when solving the problem?
- ii. Did any misconceptions arise during the number talk? If, so describe them?
- iii. What were some connections between students' strategies during the number talk?

d. **Connection to Classroom Culture and Norms:**

- i. How do you think the norms and culture of your classroom influenced the implementation of the number talk? (For example, are students in your class used to sharing strategies? What kind of math is valued in your classroom? Is math mostly conceptual, or procedural, or a combo of both?)
- ii. How did issues of status manifest in your facilitation of the Number Talk? Pay particularly attention to English Learners and students with identified disabilities.

e. **Next Steps:**

- i. What problem might you pose for the next number talk? Why would you choose these problems?
- ii. What would you do the same/differently in your next number talk? Why?
- iii. What have you learned by doing the number talks?

** Be specific in your descriptions and be sure to reference ideas from the readings and from the course in your write-up.*

TURN IN:

- Your planning documents (scanning/taking picture and embedding in Word document is fine)
- Your memos
- Write Up attending to (typed, double-spaced, 6-8 pages).

Tips and Suggestions

1. Remind students about using “quiet thumbs.”
2. Make sure to elicit and write on board ALL answers before asking for strategies.
3. Some ideas for questions
 - “Who has an answer/strategy they are willing to share?”
 - “Who has a different answer?”
 - “Who would like to defend one of the answers?” “_____, which answer would you like to defend?”
 - “Who can explain _____’s strategy in your own words?”
 - “So, Julia, it sounds like your strategy is similar to Charlotte’s. She did [x] while you did [y].
 - “Who can explain why Sabrina [multiplied by 2]?”

Don’t forget: we are not showing kids how to do anything.

If you don’t know what a student is doing or you don’t think this method is going anywhere, you can say, “I am still thinking about your method and I will get back to you later about it.”

4. Slippery Slopes:
 - Be careful not to put words into a student’s mouth; as hard as it may be, elicit his or her thinking by waiting and/or probing.
 - Be careful not to “help” students by doing their thinking for them – even though it is what they will expect you to do.
 - “Great answer!” “Right.” “Good.” “Awesome.” (We will talk more about praise in future C&I classes.)
5. When recording, be sure not to violate the equals sign! e.g, $10 \times 3 = 30 + 6 =$

- Don't be in a rush to use $3 \cdot 5$ or $3(5)$ instead of 3×5 . Symbolic notation can interfere with thinking. Use these more sophisticated symbols only when you are sure that your class is comfortable with them.
- Similarly, don't be in a rush to introduce grouping symbols; e.g., for 6×12 , if a student says, "6 times 10 is 60 and 6 times 2 is twelve; 60 plus 12 is 72," don't record it (yet) like this:

$$6 \times 12 = 6 \times (10 + 2) = (6 \times 10) + (6 \times 2) = 60 + 12 = 72$$

[Note: Symbolic notation (operations symbols, grouping symbols, m for slope, etc.) is an example of what Piaget called "social knowledge." These symbols are socially agreed-upon, not "constructed" in the mind of the learner through the understanding of mathematical relationships. Quantities and mathematical relationships what we are developing in number talks; increasingly sophisticated notation can come later.]

Planning a Number Talk

Anticipate different methods (including misconceptions) students might use for solving the problem	Identify connections between strategies.

Generate the kinds of questions you will need to be prepared to ask to fully understand and represent a student's method	Think about what you might do if very few strategies emerge, if there are wrong answers, etc.
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Number Talk

Grading Rubric

Component and Standard	Exceeds Standards	Meets Standards	Approaches Standards	Does Not Meet Standards
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Reflection on Planning	Includes clear and thoughtful rationale for selecting particular problems. Potential misconceptions are clearly described. Descriptions are detailed and rationales are thoroughly explained. Clearly describes modifications for English learners and students with identified disabilities.	Includes clear and thoughtful rationale for selecting particular problems. Potential misconceptions are described. Descriptions include some amount of detail and rationales are moderately explained. Describes modifications for English learners and students with identified disabilities.	Includes some rationale for selecting particular problems. Potential misconceptions are mentioned. Descriptions lack detail and rationales are explained minimally. Minimally describes modifications for English learners and students with identified disabilities.	Does not include rationale for selecting particular problems or potential misconceptions. Does not describe modifications for English learners and/or students with identified disabilities.
	5 points	4 points	2.5 points	0 points

Reflection on Implementation	<p>Description provides specific examples of what occurred during the number talk. Includes thoughtful and detailed reflections on what worked well, what was challenging, and what was surprising during the number talk. Description thoroughly addresses how and if Number Talks fit into or align with existing classroom culture, norms and learning experiences. Clearly addresses how issues of status manifest in your facilitation of the Number Talk with specific attention to English Learners and students with identified disabilities.</p> <p>10 points</p>	<p>Description provides specific examples of what occurred during the number talk. Includes thoughtful and moderately detailed reflections on what worked well, what was challenging, and what was surprising during the number talk. Description moderately addresses how and if Number Talks fit into or align with existing classroom culture, norms and learning experiences. Addresses how issues of status manifest in your facilitation of the Number Talk with specific attention to English Learners and students with identified disabilities.</p> <p>8 points</p>	<p>Description provides examples of what occurred during the number talk. Reflections on what worked well, what was challenging, and what was surprising during the number talk are brief and lacking in detail. Description minimally addresses how and if Number Talks fit into or align with existing classroom culture, norms and learning experiences. Minimally addresses how issues of status manifest in your facilitation of the Number Talk with some attention to English Learners and students with identified disabilities.</p> <p>5 points</p>	<p>Description provides examples of what occurred during the number talk. Does not include reflections on what worked well, what was challenging, and what was surprising. Does not address how Number Talks fit into existing classroom culture, norms and learning experiences. Does not address how issues of status manifest in your facilitation of the Number Talk.</p> <p>0 points</p>
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<p>Analysis of Student Mathematical Thinking</p> <p>Problem #1</p>	<p>Description includes rich details about how the students solved each specific problem, the strategies the students used, and/or the level of thinking and mathematical understanding that is evidenced. Draws clear connections between students' mathematical strategies.</p> <p>5 points</p>	<p>Description includes moderate details about how the students solved each specific problem. When appropriate, description names the strategy used, and/or the level of thinking and mathematical understanding evidenced. Draws moderate connections between students' mathematical strategies.</p> <p>4 points</p>	<p>Description includes details about how the students solved specific problems, but description is lacking in detail, categorization, or justification. Draws minimal connection between students' mathematical strategies.</p> <p>2.5 points</p>	<p>Description narrates how students solved sample problems, but description of student strategies are brief and generally lacking in detail. Does not draw connections between students' mathematical strategies.</p> <p>0 points</p>
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<p>Analysis of Student Mathematical Thinking</p> <p>Problem #2</p>	<p>Description includes rich details about how the students solved each specific problem, the strategies the student used, and/or the level of thinking and mathematical understanding that is evidenced. Draws clear connections between students' mathematical strategies.</p> <p>5 points</p>	<p>Description includes some details about how the students solved each specific problem. When appropriate, description names the strategy used, and/or the level of thinking and mathematical understanding evidenced. Draws moderate connections between students' mathematical strategies.</p> <p>4 points</p>	<p>Description includes details about how the students solved specific problems, but description is lacking in detail, categorization, or justification. Draws minimal connection between students' mathematical strategies.</p> <p>2.5 points</p>	<p>Description narrates how students solved sample problems, but description of students' strategies are brief and generally lacking in detail. Does not draw connections between students' mathematical strategies.</p> <p>0 points</p>
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<p>Analysis of Student Mathematical Thinking</p> <p>Problem #3</p>	<p>Description includes rich details about how the students solved each specific problem, the strategies the students used, and/or the level of thinking and mathematical understanding that is evidenced. Draws clear connections between students' mathematical strategies.</p> <p>5 points</p>	<p>Description includes some details about how the students solved each specific problem. When appropriate, description names the strategy used, and/or the level of thinking and mathematical understanding evidenced. Draws moderate connections between students' mathematical strategies.</p> <p>4 points</p>	<p>Description includes details about how the students solved specific problems, but description is lacking in detail, categorization, or justification. Draws minimal connection between students' mathematical strategies.</p> <p>2.5 points</p>	<p>Description narrates how students solved sample problems, but description of students' strategies are brief and generally lacking in detail. Does not draw connections between students' mathematical strategies.</p> <p>0 points</p>
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Next Steps	Includes thoughtful and rich reflection and rationale for next steps related to mathematics instruction. Reflection attends to at least three rich examples of what teacher anticipates doing next. 10 points	Includes thoughtful and moderate reflection and rationale for next steps related to mathematics instruction. Reflection attends to at least three examples of what teacher anticipates doing next. These examples are moderate in detail. 8 points	Includes reflection on next steps related to mathematics instruction. Reflection attends to fewer than three examples of what teacher anticipates doing next. These examples are minimal in detail. 5 points	Does not attend to next steps. 0 points
Planning Documents	Planning documents are completed and turned in with description of students' strategies, misconceptions and next steps thoroughly explained. 5 points	Planning documents are completed and turned in with description of students' strategies, misconceptions and next steps are explained in moderate detail. 4 points	Planning documents are completed and turned in with description of student's strategy, misconceptions and next steps are explained in minima detail. 2.5 points	Planning documents are not turned in. 0 points

Connection to course readings and ideas	<p>Draws on specific examples and key ideas from course readings to support the claims made.</p> <p>Connections to reading are well founded and relevant to author's argument.</p> <p>Connections are made throughout the write-up.</p> <p>10 points</p>	<p>Draws on specific examples and key ideas from course readings to support the claims made.</p> <p>Connections to readings are mostly relevant to author's argument.</p> <p>Connections are made throughout the write-up.</p> <p>8 points</p>	<p>Draws minimally on specific examples and key ideas from course readings to support the claims made.</p> <p>Connections to readings are not relevant to author's argument.</p> <p>5 points</p>	<p>No connections to course readings.</p> <p>0 points</p>
Academic Writing	<p>Writing is clear, and free of spelling and grammatical errors. Paper is well organized and easy to follow.</p> <p>5 points</p>	<p>Writing is free of spelling and grammatical errors, but has occasional lapses in clarity and/or organization, OR occasional errors in spelling and/or grammar.</p> <p>4 points</p>	<p>Writing has occasional errors in spelling and/or grammar, and has at least one sentence/idea that is lacking in clarity.</p> <p>2.5 points</p>	<p>Writing includes multiple spelling and or grammatical errors, and is generally unclear.</p> <p>0 points</p>