

Rutgers, The State University of New Jersey

05:300:341:01 Modern High School Mathematics

Fall 2014

Mondays and Wednesdays 2:50-4:10

ED - 30

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Office Hours: Monday, 1:00pm – 2:20pm, or by appointment	Prerequisites or other limitations: Preq: 01:198:111 or equivalent, 01:640:250 and 01:640:251 Coreq: 01:198:107
Mode of Instruction: <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Seminar <input type="checkbox"/> Hybrid <input type="checkbox"/> Online <input type="checkbox"/> Other	Permission required: <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes Directions about where to get permission numbers: from the instructor

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentations: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

Course Description

New Jersey Professional Standards for Teachers (2014)¹:

Standard One: Learner Development. The teacher understands how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.

ii. Essential Knowledge:

- (1) The teacher understands how learning occurs--how learners construct knowledge, acquire skills, and develop disciplined thinking processes--and knows how to use instructional strategies that promote student learning;
- (2) The teacher understands that each learner's cognitive, linguistic, social, emotional, and physical development influences learning and knows how to make instructional decisions that build on learners' strengths and needs;

iii. Critical Dispositions:

- (1) The teacher respects learners' differing strengths and needs and is committed to using this information to further each learner's development;

- (2) The teacher is committed to using learners' strengths as a basis for growth, and their misconceptions as opportunities for learning;
- (3) The teacher takes responsibility for promoting learners' growth and development; and

Standard Two: Learning Differences. The teacher uses understanding of individual differences and diverse cultures and communities to ensure inclusive learning environments that enable each learner to meet high standards.

ii. Essential Knowledge:

- (1) The teacher utilizes resources related to educational strategies for instruction and methods of teaching to accommodate individual differences and to employ positive behavioral intervention techniques for students with autism and other developmental disabilities;
- (2) The teacher understands and identifies differences in approaches to learning and performance and knows how to design instruction that uses each learner's strengths to promote growth;
- (5) The teacher understands that learners bring assets for learning based on their individual experiences, abilities, talents, prior learning, and peer and social group interactions, as well as language, culture, family, and community values; and

iii. Critical Dispositions:

- (1) The teacher believes that all learners can achieve at high levels and persists in helping each learner reach his or her full potential;
- (3) The teacher makes learners feel valued and helps them learn to value each other; and

Standard Three: Learning Environments. The teacher works with others to create environments that support individual and collaborative learning, and that encourage positive social interaction, active engagement in learning, and self motivation.

ii. Essential Knowledge:

- (2) The teacher knows how to help learners work productively and cooperatively with each other to achieve learning goals;
- (3) The teacher knows how to collaborate with learners to establish and monitor elements of a safe and productive learning environment including norms, expectations, routines, and organizational structures;
- (5) The teacher knows how to use technologies and how to guide learners to apply them in appropriate, safe, and effective ways; and

iii. Critical Dispositions:

- (2) The teacher values the role of learners in promoting each other's learning and recognizes the importance of peer relationships in establishing a climate of learning;
- (3) The teacher is committed to supporting learners as they participate in decision-making, engage in exploration and invention, work collaboratively and independently, and engage in purposeful learning; and
- (4) The teacher seeks to foster respectful communication among all members of the learning community.

Standard Four: Content Knowledge. The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches, particularly as they relate to the Common Core Standards and the New Jersey Core Curriculum Content Standards and creates learning experiences that make these aspects of the discipline accessible and meaningful for learners to assure mastery of the content.

ii. Essential Knowledge:

- (1) The teacher understands major concepts, assumptions, debates, processes of inquiry, and ways of knowing that are central to the discipline(s) he or she teaches;
- (2) The teacher understands common misconceptions in learning the discipline and how to guide learners to accurate conceptual understanding;
- (5) The teacher has a deep knowledge of student content standards and learning progressions in the discipline(s) he or she teaches;
- (7) The teacher understands the concepts inherent in numeracy to enable students to represent physical events, work with data, reason, communicate mathematically, and make connections within their respective content areas in order to solve problems.

iii. Critical Dispositions:

- (4) The teacher is committed to work toward each learner's mastery of disciplinary content and skills; and

- (5) The teacher shows enthusiasm for the discipline(s) they teach and is committed to making connections to everyday life.

Standard Five: Application of Content. The teacher understands how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic local and global issues.

ii. Essential Knowledge:

- (1) The teacher understands the ways of knowing in his or her discipline, how it relates to other disciplinary approaches to inquiry, and the strengths and limitations of each approach in addressing problems, issues, and concerns.
- (4) The teacher understands how to use digital and interactive technologies for efficiently and effectively achieving specific learning goals;
- (5) The teacher understands critical thinking processes and knows how to help learners develop high level questioning skills to promote their independent learning;
- (6) The teacher understands communication modes and skills as vehicles for learning (for example, information gathering and processing) across disciplines as well as vehicles for expressing learning;
- (7) The teacher understands creative thinking processes and how to engage learners in producing original work

iii. Critical Dispositions:

- (3) The teacher values flexible learning environments that encourage learner exploration, discovery, and expression across content areas.

Standard Six: Assessment. The teacher understands and uses multiple methods of assessment to engage learners in examining their own growth, to monitor learner progress, and to guide the teacher's and learner's decision-making.

ii. Essential Knowledge:

- (1) The teacher understands the differences between formative and summative applications of assessment and knows how and when to use each;
- (2) The teacher understands the range of types and multiple purposes of assessment and how to design, adapt, or select appropriate assessments to address specific learning goals and individual differences, and to minimize sources of bias;

iii. Critical Dispositions:

- (1) The teacher is committed to engaging learners actively in assessment processes and to developing each learner's capacity to review and communicate about their own progress and learning;
- (2) The teacher takes responsibility for aligning instruction and assessment with learning goals;

Standard Seven: Planning for Instruction. The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.

ii. Essential Knowledge:

- (1) The teacher understands content and content standards and how these are organized in the curriculum;
- (2) The teacher understands how integrating cross-disciplinary skills in instruction engages learners purposefully in applying content knowledge;
- (4) The teacher understands the strengths and needs of individual learners and how to plan instruction that is responsive to these strengths and needs;

iii. Critical Dispositions:

- (1) The teacher respects learners' diverse strengths and needs and is committed to using this information to plan effective instruction;

Council for the Accreditation of Education Professionals (2013)²:

Standard 1: Candidate Knowledge, Skills, and Dispositions

1.1 Content Knowledge and Pedagogical Knowledge

1.2 Instructional Practice

- Learning Experiences

1.6 Learner and Learning

- Learning Experiences
- 1.8 Learner and Learning
- Relationships and Communication

¹ <http://www.state.nj.us/education/code/current/title6a/chap9.pdf>

² http://caepnet.files.wordpress.com/2013/09/final_board_approved1.pdf

Course catalogue description

In-depth study and concentration of some key ideas in the high school mathematics curriculum. Viewing of mathematics in terms of the ideas built up in the minds of students.

Other description of course purposes, context, methods, etc.:

The primary goal of this course is for you to develop a deep understanding of concepts of high school mathematics. At the end of this course, you should be able to understand and explain why the procedures learned in high school mathematics work, describe different ways of representing important concepts, and explain the relationships different mathematical concepts.

Secondary goals of this course include: recognizing the importance for students and teachers to have a conceptual understanding of mathematics; thinking deeply about what it means to understand a mathematical concept; discussing what type of teaching can help students understand concepts and what type of teaching might be counterproductive to this goal; recognizing when your understanding of a concept is not as strong as you'd like it to be and seeing the need to remedy this situation; and gaining a general familiarity with main ideas of mathematics education (such as the NCTM's Principles and Standards and the Common Core State Standards).

Course Background:

Since the National Council of Teachers of Mathematics (NCTM) published their *Standards for School Mathematics* in 1989 and the country-wide acceptance of the *Common Core State Standards for Mathematics* (CCSSM) since 2010, there has been a significant change in the way that mathematics courses have been taught. Previously, mathematics courses were centered around giving students a *procedural understanding* of mathematics – that is, the goal of these classes was for students to recognize situations when a procedure (e.g. adding fractions, solving a linear equation) would be useful and apply the procedure correctly. Recently, the emphasis shifted to teaching for *conceptual understanding* – students are now expected to:

- know why the rules they are applying work
- be able to *represent* and think about math concepts in meaningful ways
- see connections between the concept they are studying and other mathematical topics

Achieving these goals puts new and challenging demands on teachers. They now not only need to know the collection of mathematical procedures that students will learn, but also why the procedures work, how the relevant concepts can be represented, and how to help students learn these things. Many teachers lack this knowledge. For instance, most mathematics teachers are familiar with the fact that $\log_b x + \log_b y = \log_b xy$. However, these teachers cannot design lessons to help students understand why rules like this are true because the teachers do not understand

why themselves. *Modern High School Mathematics* is designed to address this gap by looking at high school mathematics in a deeper way.

Required Texts:

There are no required textbooks for this course. Students will be responsible for reading various articles, research papers, and other selected materials. These resources will be available on the Sakai course site under *Resources*.

Grading Policy

Your grade for the course will be composed of the following:

I. Class participation/attendance	10%
II. Bi-Weekly Journal Entries	10%
III. Quizzes	10%
IV. Class assignments	40%
V. Lesson plan	10%
VI. Unit plan	10%
VII. End of Class Reflection Paper	10%

Letter Grade Equivalents:

The grading will be as follows-

A = 100-90%	B+= 89-87%
B = 86-80%	C+= 79-77%
C = 76-70%	D = 69-60%
F < 60%	

Academic Integrity Policy:

Any violation of academic honesty is a serious offense and is therefore subject to an appropriate penalty. Refer to <http://academicintegrity.rutgers.edu/integrity.shtml> for a full explanation of policies. This policy will be strictly enforced in the *Modern High School Mathematics* course.

Web site:

<https://sakai.rutgers.edu/portal> (Specific course Sakai access will be available only to those students who have officially registered for this course.)

Course Requirements

Attendance (this policy is separate from the participation grade)

You are allowed ONE absence, which I will assume is for a good reason. Beyond that, your final grade will be reduced as indicated (unless, of course, you have a doctor's note or other documentation indicating a bona fide reason): 2 absences—reduction of a half grade; 3 absences—reduction of 1 full grade; 4 absences—failing grade in course. Again, if it is an excused absence, you are responsible for contacting me, getting the course materials, and making up for the class in order to receive the participation points.

I. Class Participation (10%)

You are expected to participate in class. Each week you will have readings and you will need to be prepared to discuss the content of the readings and ask questions in class. Aside from the readings, we will be engaging in discussions, group work, and individual activities in class. Your engagement in the course determines how successful the class will be and how much you will learn. You can earn a maximum of 2 points each class for in-class participation, individual assignments, completing the readings, and completing group work. **If you miss a class for an excused absence, you can make up the points by doing out of class activities.** Use of cell phones, laptops, and other electronic devices is **strictly prohibited** during class sessions; non-compliance will result in a reduction of Class Participation credit.

II. Bi-Weekly Journal Entries (10%)

Students will submit 1 bi-weekly journal entry via the Forums feature of the Sakai course site, for a total of 7 entries in all. Additionally, during this time, each student should respond to at least two journal entries of their peers. Each student should strive to connect their personal thoughts about teaching and learning of mathematics to a specific reading, specific content standards, a specific class discussion, or a specific activity in class. You will receive points for your postings if they are thoughtful and relate to specific class topics and readings.

no minimum length, quality, not quantity

To maintain high quality discussions, here are some guidelines:

- Post in a timely manner. Do not save course reading or postings until the last minute. Because part of your responsibilities will include responding to your peers' posts, a late post can jeopardize your peers' contributions and grades.
- Provide thoughtful, detailed responses to questions and your peers' posts. It is necessary to support your opinions and ideas with material from our class readings and discussions.
- Use academic language (not "texting language" you might use on a cell phone with friends) for your on-line contributions. Make sure you cite material/text/concepts from other sources.

III. Quizzes (10%)

There will be a variety of readings required for the class. These readings are essential to helping you build your philosophy about teaching and to provide you with a strong foundation for practice. To ensure that you fully engage with the readings, a short quiz may be given the day the readings are due. The quizzes will be designed such that if you completed the readings, you will successfully complete the quiz. Quizzes may also be given on content and your own conceptual understanding of the concepts we cover in class.

IV. Class Assignments (40%)

There will be a variety of class assignments during the semester. These assignments will range from small group projects to in-class quizzes that evaluate conceptual understanding of mathematical ideas. A brief explanation of selected assignments is provided below. Further details and due dates will be given during the semester.

Class assignments:

- *District Math Tracking Exploration:* Research the math tracking system of your home district. Make notes about how students are tracked, the math classes that are available, how placement in “tracks” are determined. Compare your findings with a partner.
- *Standards Exploration:* In a small group, research a concept and compare it across NCTM, Content Core, and NJ Core standards. Prepare a brief presentation that explains the concept and the associated standards.
- *Conceptual/Concrete Activity:* Choose a topic found in HS mathematics courses and research how to teach it conceptually/concretely. Write a descriptive summary of your idea and present it to the class.

V. Lesson Plan (10%) (portfolio item)

Prepare a high school mathematics lesson plan that is consistent with the Rutgers GSE lesson plan template in the *Teacher Education Portfolio* on Sakai. All lesson plan topics will be pre-determined. The lesson’s primary objective is to “teach for conceptual understanding”; in other words, all planned lesson activities and assignments should strategically expose high school students to the underlying connections and reasoning behind a mathematical concept or procedure. You can use the conceptual idea you developed as the basis for your lesson plan.

VI. Group/Individual Unit Plan (10%) (portfolio item)

Prepare a unit plan that is consistent with the Rutgers GSE unit plan template in the *Teacher Education Portfolio* on Sakai. The unit plan will be developed as a group. Then a unique subset of that unit plan will be handed in by each student as an individual unit plan.

VII. End of Course Reflection Paper (10%)

Prepare a 1 to 2 page paper reflecting on your work in this course. You should reflect on your knowledge of the mathematics, how students learn, and implications for teaching with regard to the standards. You may review your postings on the course web site and notes from problem solving and sharing of solutions as you develop your reflective assessment.

Teaching portfolio (TEAC): At the end of the course you will upload all of the documents that are required for your teaching portfolio. These include your individual lesson and unit plans.

Academic Honesty:

- The Rutgers University Code of Student Conduct can be accessed at <http://policies.rutgers.edu/PDF/Section10/10.2.11-current.pdf>
- For further information about the university’s Academic Integrity Policy, please visit <http://studentconduct.rutgers.edu/academic-integrity>
- Related regulations may also be found under the Academic Policies and Procedures section of the Rutgers Graduate School of Education catalog found at http://catalogs.rutgers.edu/generated/gse_current/pg32.htm

For any and all assignments and class activities, including in-class quizzes, take-home quizzes, tests, papers, field projects, PowerPoint presentations, and any other class-related work, no copying of any kind is allowed, unless copied text is placed within quotations and the

author/source is appropriately cited. Clear evidence of extensive plagiarism will likely result in a grade of F for the assignment and course.

While using the internet and curricula to research ideas for activities, lesson plans, assessments, etc., is encouraged, any ideas that are taken from these resources must be cited properly to prevent plagiarism. However, any resource that is picked up from the internet or curricula and used word for word or problem for problem, even if cited properly, will NOT satisfy the requirements for this class. All handed in work must be original.

Tentative Weekly Course Outline
*****Syllabus Subject to change*****

Week/Dates of Classes	High School Content Area	Assignments Due
<u>Week 1</u> - Wed., Sept. 3 rd	Introduction	
<u>Week 2</u> - Mon., Sept. 8 th - Wed., Sept. 10 th	<i>Number & Numerical Operations</i> • District Math Tracking Activity assignment	Monday: Math tutoring opportunity. <i>Relational Understanding and Instrumental Understanding, Skemp</i>
<u>Week 3</u> - Mon., Sept. 15 th - Wed., Sept. 17 th	<i>Patterns & Algebra</i> <i>What's an SGO?</i>	Wed: Journal Entry #1 Wed: District Math Tracking Exploration
<u>Week 4</u> - Mon., Sept. 22 th - Wed., Sept. 24 rd	<i>Representation</i> • http://nlvm.usu.edu/en/nav/topic_t_1.html	<i>Understanding Algebra through Graphing Calculators, Cates</i>
<u>Week 5</u> - Mon., Sept. 29 th - Wed., Oct. 1 nd	<i>Reasoning & Proof</i> • Common Core State Standards Activity assignment	Ma Intro and Chapter 1 Wed: Journal Entry #2

<p>Week 6 - Mon. Oct. 6th - Wed., Oct. 8th</p>	<p><i>Reasoning & Proof</i> • Conceptual/Concrete Activity assignment</p>	<p>Wed: Common Core State Standards Activity</p>
<p>Week 7 - Mon., Oct. 13th - Wed., Oct. 15th</p>	<p><i>Measurement</i> • Common Core State Standards sharing</p>	<p>Wed: Journal Entry #3</p>
<p>Week 8 - Mon., Oct. 20st - Wed., Oct. 22rd</p>	<p><i>Communication</i> http://www.crewtonramoneshouseofmath.com/completing-the-square.html <i>What is the Danielson framework?</i></p>	<p>Ma <i>Chapter 2</i> Wed: Final Common Core State Standards Activity</p>
<p>Week 9 - Mon., Oct. 27th - Wed., Oct. 29th</p>	<p><i>Technology</i> • Teacher Portfolio • Activity Sharing • Lesson Plan assignment</p>	<p>Mon: Conceptual/Concrete Activity Wed: Journal Entry #4</p>
<p>Week 10 - Mon., Nov. 3th - Wed., Nov. 5th</p>	<p><i>Advanced Algebra</i> • Activity sharing</p>	
<p>Week 11 - Mon., Nov. 10th - Wed., Nov. 12th</p>	<p><i>Data Analysis, Probability & Discrete Mathematics</i> • Unit Plan assignment</p>	<p>Wed: Journal Entry #5</p>
<p>Week 12 - Mon., Nov. 17th - Wed., Nov. 19th</p>	<p><i>Pre-Calculus</i></p>	<p>Mon: Lesson Plan <i>Calculational and Conceptual Orientations in Teaching Mathematics</i>, Thompson</p>
<p>Week 13 - Mon., Nov. 24th - NO CLASS: WED. 11/26 (Friday classes)</p>	<p><i>Trigonometry</i> <i>What is PARCC?</i></p>	<p><i>Teacher Questioning to Promote Justification and Generalization in Mathematics: What Research Practice has Taught Us</i>, Martino, Maher Wed: Journal Entry #6</p>
<p>Week 14</p>	<p><i>Calculus</i></p>	

<ul style="list-style-type: none"> - Mon., Dec. 1st - Wed., Dec. 3th 		Wed: Unit Plan
<p><u>Week 15</u></p> <ul style="list-style-type: none"> - Mon., Dec. 8th - Wed., Dec. 10th 	<i>Calculus</i>	Wed: Journal Entry #7
<p><u>Reading Days</u></p> <p>Thurs., Dec. 11th Fri., Dec. 12th</p> <p>Dec. 15 – Dec. 22 GOOD LUCK ON EXAMS! 😊</p>		<p>Before Wed. Dec. 17: Reflection paper</p>

****Syllabus subject to change****