

Methods of Teaching and Assessing Secondary Mathematics
05:300:443, 3 Credits
Spring 2021
Tuesdays 4:30-7:30

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Phone #: 848-932-0806	Room: Online
Office Hours: by appointment	Prerequisites or other limitations: Admission to the program
Mode of Instruction: <input type="checkbox"/> Lecture <input type="checkbox"/> Hybrid <input checked="" type="checkbox"/> Seminar <input type="checkbox"/> Online <input type="checkbox"/> Other	Permission required: <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes

Background

To teach secondary school mathematics effectively requires attention to and knowledge of many factors. These factors include:

- mathematical content, processes, structures, and applications;
- learning objectives and hierarchies of mathematical prerequisites;
- strategies of motivation and diverse engaging classroom activities (including explorations, learning through problem solving, creating and investigating mathematical representations)
- strategies for differentiating instruction
- cultural and gender influences
- the purposes and design of assessments.

This course is designed to help develop professional expertise in all of these.

Students with Disabilities

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 addressed in this course:

Standard 1. Learner Development	The teacher understands how learners grow and develop, recognizing that patterns of learning and development vary within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences
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Standard 2. 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.
Standard 3. 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.
Standard 4. 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.
Standard 5. 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.
Standard 6. 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.
Standard 7. 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.
Standard 8. Instructional Strategies	The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways

National Council of Teachers of Mathematics (NCTM) Council for the Accreditation of Educator Preparation (CAEP) Standards (2012)

Standard 3. Content Pedagogy

Effective teachers of secondary mathematics apply knowledge of curriculum standards for mathematics and their relationship to student learning within and across mathematical domains. They incorporate research-based mathematical experiences and include multiple instructional strategies and mathematics-specific technological tools in their teaching to develop all students' mathematical understanding and proficiency. They provide students with opportunities to do mathematics –talking about it and connecting it to both theoretical and real-world contexts. They plan, select, implement, interpret, and use formative and summative assessments for monitoring student learning, measuring student mathematical understanding, and informing practice.

Preservice teacher candidates:

- 3a) Apply knowledge of curriculum standards for secondary mathematics and their relationship to student learning within and across mathematical domains.
- 3b) Analyze and consider research in planning for and leading students in rich mathematical learning experiences.
- 3c) Plan lessons and units that incorporate a variety of strategies, differentiated instruction for diverse populations, and mathematics-specific and instructional technologies in building all students' conceptual understanding and procedural proficiency.
- 3d) Provide students with opportunities to communicate about mathematics and make connections among mathematics, other content areas, everyday life, and the workplace.

- 3e) Implement techniques related to student engagement and communication including selecting high quality tasks, guiding mathematical discussions, identifying key mathematical ideas, identifying and addressing student misconceptions, and employing a range of questioning strategies.
- 3f) Plan, select, implement, interpret, and use formative and summative assessments to inform instruction by reflecting on mathematical proficiencies essential for all students.
- 3g) Monitor students' progress, make instructional decisions, and measure students' mathematical understanding and ability using formative and summative assessments.

Standard 4. Mathematical Learning Environment

Effective teachers of secondary mathematics exhibit knowledge of adolescent learning, development, and behavior. They use this knowledge to plan and create sequential learning opportunities grounded in mathematics education research where students are actively engaged in the mathematics they are learning and building from prior knowledge and skills. They demonstrate a positive disposition toward mathematical practices and learning, include culturally relevant perspectives in teaching, and demonstrate equitable and ethical treatment of and high expectations for all students. They use instructional tools such as manipulatives, digital tools and virtual resources to enhance learning while recognizing the possible limitations of such tools.

Preservice teacher candidates:

- 4a) Exhibit knowledge of adolescent learning, development, and behavior and demonstrate a positive disposition toward mathematical processes and learning.
- 4b) Plan and create developmentally appropriate, sequential, and challenging learning opportunities grounded in mathematics education research in which students are actively engaged in building new knowledge from prior knowledge and experiences.
- 4c) Incorporate knowledge of individual differences and the cultural and language diversity that exists within classrooms and include culturally relevant perspectives as a means to motivate and engage students.
- 4d) Demonstrate equitable and ethical treatment of and high expectations for all students.
- 4e) Apply mathematical content and pedagogical knowledge to select and use instructional tools such as manipulatives and physical models, drawings, virtual environments, spreadsheets, presentation tools, and mathematics-specific technologies (e.g., graphing tools, interactive geometry software, computer algebra systems, and statistical packages); and make sound decisions about when such tools enhance teaching and learning, recognizing both the insights to be gained and possible limitations of such tools.

Standard 5: Impact on Student Learning

Effective teachers of secondary mathematics provide evidence demonstrating that as a result of their instruction, secondary students' conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and application of major mathematics concepts in varied contexts have increased. These teachers support the continual development of a productive disposition toward mathematics. They show that new student mathematical knowledge has been created as a consequence of their ability to engage students in mathematical experiences that are developmentally appropriate, require active engagement, and include mathematics-specific technology in building new knowledge.

Preservice teacher candidates:

- 5a) Verify that secondary students demonstrate conceptual understanding; procedural fluency; the ability to formulate, represent, and solve problems; logical reasoning and continuous reflection on that reasoning; productive disposition toward mathematics; and the application of mathematics in a variety of contexts within major mathematical domains.
- 5b) Engage students in developmentally appropriate mathematical activities and investigations that require active engagement and include mathematics-specific technology in building new knowledge.
- 5c) Collect, organize, analyze, and reflect on diagnostic, formative, and summative assessment evidence and determine the extent to which students' mathematical proficiencies have increased as a result of their instruction.

Standard 7: Secondary Mathematics Field Experiences and Clinical Practice

Effective teachers of secondary mathematics engage in a planned sequence of field experiences and clinical practice under the supervision of experienced and highly qualified mathematics teachers. They develop a broad experiential base of knowledge, skills, effective approaches to mathematics teaching and learning, and

professional behaviors across both middle and high school settings that involve a diverse range and varied groupings of students. Candidates experience a full-time student teaching/internship in secondary mathematics directed by university or college faculty with secondary mathematics teaching experience or equivalent knowledge base.

Preservice teacher candidates:

- 7a) Engage in a sequence of planned field experiences and clinical practice prior to a full-time student teaching/internship experience that include observing and participating in both middle and high school mathematics classrooms and working with a diverse range of students individually, in small groups, and in large class settings under the supervision of experienced and highly qualified mathematics teachers in varied settings that reflect cultural, ethnic, linguistic, gender, and learning differences.

Course catalog description:

Reviews the status of secondary mathematics teaching in the United States, the reform movement of the 1990s, and current thinking about issues of concern to practicing teachers. Encourages development of personal style and approach to teaching high school mathematics. Topics include instructional planning, assessment, individual differences, cultural and gender differences, and teaching styles.

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

This course is designed for candidates who will become middle and/or high school teachers of mathematics. The goal of this course is for students to develop knowledge about the development of learners' mathematical reasoning and ways to design instruction based on that knowledge. The course will provide a repertoire of pedagogical techniques and routines related to the above as well as a base to reflect upon one's role as a mathematics teacher within a community. Specifically, students will:

1. develop an understanding of the content and structure of state standards for mathematical practice and content, particularly the New Jersey Student Learning Standards for Mathematics;
2. examine mathematical content, processes, structure, and applications through the study of problem solving;
3. review and evaluate standards-based curriculum materials for developing unit plans, selecting tasks, and designing learning experiences;
4. demonstrate knowledge of different purposes of mathematics assessments through analysis and design of assessments oriented toward various purposes;
5. analyze mathematical reasoning, representations, mathematical discourse and teacher moves in order to assess learning and as a reflection on teaching;
6. explore hierarchies of mathematical prerequisites, construct learning objectives, and plan differentiated instruction that accommodates various learners;
7. Select and use appropriate research-based strategies for motivating and engaging students, establishing an effective learning environment, and ensuring equitable access to mathematical ideas;
8. examine equity, agency, identity, and cultural and gender issues- including "culturally relevant pedagogy" and "stereotype threat," - as these pertain to mathematics teaching and learning.
9. evaluate and model their teaching from the perspective of standards and research, employing tools of inquiry and using data to drive decision-making.

Course materials (required):

- Schoen, H. L. (2003). Teaching mathematics through problem solving 6-12. The National Council of Teachers of Mathematics (NCTM). (ISBN: 978-0873535410)
- Small, M., & Lin. A. (2010). More good questions: Great ways to differentiate secondary mathematics instruction. New York, NY: Teachers College Press. (ISBN: 978-0807750889)
- Smith, M. S. & Stein, M. K. (2018). 5 Practices for orchestrating productive mathematics discussions. 2nd Ed. The National Council of Teachers of Mathematics (NCTM). (ISBN: 978-1680540161)

Membership in the National Council of Teachers of Mathematics (NCTM.org) is also a course requirement.

Academic Integrity and Academic Honesty Policy:

In this course, the standard Academic Integrity Policy and Academic Honesty Policy of Rutgers University, including rules regarding plagiarism, will be strictly enforced. The relevant regulations are accessible via the following links:

- [Academic Integrity Policy for Rutgers undergraduate and graduate students](#)
- [Rutgers University Code of Student Conduct](#)
- [Academic Integrity Policy](#)
- [Related regulations](#) may also be found under the *Academic Policies and Procedures* section of the Rutgers Graduate School of Education catalog

For various assignments, you are permitted or expected to use material from published or on-line sources. When this occurs, you must specify which material was referenced, and provide a citation. You must place quotations from sources in quotes, and in each case make clear the source from which you are quoting. If you have questions or doubts, please bring these up for discussion.

Responsibilities

In addition to required course assignments (see below), you are expected to fulfill the following responsibilities:

- *Class attendance:* Class attendance is required. If you must miss a class for good reason, please let me know in advance. Absences will reduce your final grade if not for a bona fide reason (e.g., a medical note, or an absence approved in advance). If it is an excused absence, you are responsible for contacting the instructor, getting the course materials, and making up for the class. Repeated lateness may lower your class participation grade.
- *Class participation:* In many class meetings, there will be extended periods of time when you are asked to participate in an activity, sometimes with a partner, followed by discussion. A high level of attention, engagement, and involvement is expected of everyone. You will be expected to present (sometimes partial or incorrect) ideas to the class for discussion.
- *Postings and assignments:* Most weeks, you will be asked to complete an assignment and/or to post comments on readings for the following week, or on topics discussed in class during the weeks before. Keeping up with these in a timely way is essential.

Course assignments and grading

Your assignments consist of five components, each of which counts a somewhat different percentage.

- *Participation (20%)* – Students’ participation grade will be based on their active engagement with weekly class activities and discussions.
- *Weekly assignments (20%)* – For most weeks, students will be assigned a course reading. Every week, the reading will be discussed on the course Canvas site. Students will be provide a summary of the reading, *what instructional insights can be drawn from the reading, criticisms of the reading, and questions about the reading for their classmates.* This summary should be posted by **Saturday at noon** before the next class to give other students the opportunity to respond. All students are expected to discuss posts by **Monday at noon**, either by answering a classmate’s questions or building on their points. These, and any additional written assignments, will be evaluated for substance, quality, and thoughtfulness.
- *Lesson planning, micro-teaching and assessment (25%)* – Students will plan and give a short mathematics lesson, followed by *peer critique*, reflections, and analyses to be posted and evaluated. Detailed instructions will be provided. For those in teacher certification programs, these assignments will constitute your first “clinical teaching work sample” (CTWS1). More experienced teachers will develop, present, and discuss a model mathematical activity to the class.
- *Unit planning (25%)* – Students will develop model unit plans on selected topics in secondary mathematics. This will involve collaborative group planning: analysis of prerequisites, identification of conceptual and proficiency objectives, motivational and culturally relevant strategies, language

goals, sequencing of content and activities, and assessment plans. Each student will then refine and submit a unit plan for evaluation.

- *Reflection paper* (10%). Detailed instructions will be provided.

Grade Ranges:

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

Course Schedule (subject to change depending on weather, pacing, and student learning):

Week	Class Date	Topic	Assignments/Readings
1	1/19	Introduction; State Standards	NJSLS Obtain NCTM student membership
2	1/26	Coherence, progressions and learning objectives;	Smith & Stein
3	2/2	Learning objectives; Task and lesson design; Representations;	Smith & Stein
4	2/9	Mathematical prerequisite skills; Differentiating instruction;	Small & Lin
5	2/16	Assessment in mathematics: purposes, design, uses and misuses; More on differentiating instruction	Small & Lin
6	2/23	Unit planning; Analysis of programs;	Microteaching lesson plans (group #1) Schoen
7	3/2	Microteaching and critique #1; Unit planning group activity Problem-solving	Microteaching lesson plans (group #2) Microteaching analyses due 3/9
8	3/9	Microteaching and critique #2; Unit planning; Identity, agency and equity based practices;	Microteaching lesson plans (group #3) Microteaching analyses due 3/23
	3/16	Spring break week – No class meeting	
10	3/23	Microteaching and critique #3; Computational Thinking	Microteaching analyses due 3/30 Schoen
11	3/30	Unit planning and motivation	Schoen

Week	Class Date	Topic	Assignments/Readings
12	4/6	Unit planning discussion; Representations and reasoning	Microteaching lesson plans (group #4) Schoen
13	4/13	Microteaching and critique #4; Representations and reasoning	Microteaching lesson plans (group #5) Microteaching analyses due 4/20 Unit plan due
14	4/20	Microteaching and critique #5; More on assessment: summative	Microteaching analyses due 4/27 Schoen
15	4/27	Closing/Reflection	Reflection due

Week-by-week topics and assignments are subject to change. Please remain current with the assignment information posted on Canvas.