

15:254:543 Background for Teaching Elementary School Mathematics (15:254:543:01)
3 Credits

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Office Hours: Tuesday 6:30-7:30 & by appointment Office: GSE 213	Prerequisites or other limitations: 05:300:200 and admission to the program Coreq: 251:671
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

Learning goals

I have designed this mathematics methods course to focus both on the details of children's mathematics thinking, as well as how to use student thinking as a way to ground learning about the teaching of mathematics. The class will focus on preparing you to begin your career and learn as you teach. As we address student thinking and instructional routines we will also discuss ways to accommodate various learners and critical aspects of the teaching and learning of mathematics and: *equity (racial, ethnicity, SES, gender, language, (dis)ability), the use of mathematical tools, and pedagogically meeting the needs of all students.* We will use the state content standards, readings, student work, classroom video, curricula, instructional scenarios, including designing and implementing lesson plans in your practicum placement to examine these issues.

Goals:

To develop:

- knowledge of the mathematics in the elementary grades
- detailed knowledge about the development of children's mathematical thinking
- ways to build instruction based on the development of students mathematical thinking
- a repertoire of pedagogical techniques and routines related to the above
- a sense of equity and access inside and outside of the mathematics classroom and modifications for various learners

Continue to reflect on your role as a mathematics teacher within a community.

Course catalog description:

Concrete, manipulative approach to teaching mathematics concepts. Psychology of learning mathematics; the elementary curriculum; effective teaching techniques.

Required Texts:

- Hiebert et al. (1997). **(MS)** Making Sense: Teaching and Learning Mathematics with Understanding. Heinemann. (ISBN: 978-2854186055)
- Coggins et al. (2007). **(ELLs)** English Language Learners in the Mathematics Classroom. Corwin Press. (ISBN: 978-1412937603)

Recommended Texts:

Carpenter et al. (1999). **(CM)** Children's Mathematics: Cognitively Guided Instruction. Heinemann. (ISBN: 978-0325001371)

Other readings will be available electronically

New Jersey Teaching Professional Standards addressed in this course:

Teachers know and understand:

- 1.1 In-depth the subject matter they plan to teach and the relationship of that discipline to other content areas;
- 1.2 The evolving nature of the discipline or subject matter knowledge and the need for keeping abreast of new ideas and understanding of the discipline;
- 1.4 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.

Teachers value and are committed to:

- 1.5 Appreciating multiple perspectives and conveying to learners how knowledge is developed from the vantage point of the knower; and
- 1.6 Enthusiasm for the discipline(s) they teach and in making connections to every day life.

Teachers engage in activities to:

- 1.7 Promote the development of critical and creative thinking, problem-solving and decision-making skills by engaging students in formulating and testing hypotheses according to the methods of inquiry and standards of evidence within the discipline;
- 1.8 Make effective use of multiple representations and explanations of disciplinary concepts that capture key ideas and link them to students' prior understanding; and
- 1.9 Evaluate teaching resources and curriculum materials for their completeness, accuracy and usefulness for representing particular ideas and concepts.

Teachers know and understand:

- 2.1 How students construct knowledge, acquire skills and develop habits of mind and how to use instructional strategies that promote student learning;
- 2.2 How student learning is influenced by individual experiences, talents and prior learning, as well as language, culture, family, and community values; and
- 2.3 How to identify and teach to the developmental abilities of students, which may include learning differences, visual and perceptual differences, cultural and socio-emotional differences, special physical or emotional challenges and gifted and talented exceptionalities.

Teachers value and are committed to:

- 2.6 Appreciation for multiple ways of knowing;
- 2.7 The diverse talents of all students and to helping them develop self-confidence and subject matter competence; and
- 2.8 The belief that all children and adolescents can learn at high levels and achieve success.

Teachers engage in activities to:

- 3.9 Use strategies to support the learning of students whose first language is not English; and
- 3.10 Use knowledge of students and their lives to design and carry out instruction that builds on students' strengths while meeting their needs and taking into account issues of social class, gender, race, ethnicity, language, sexual orientation, age and special needs.

Teachers know and understand:

- 4.1 How to plan instruction based on students' needs, developmental progress and prior knowledge;
- 4.3 Techniques for modifying instructional methods, materials and the environment to help all students learn; and
- 4.4 A variety of instructional approaches and the use of various technologies, to promote thinking and understanding.

Teachers value and are committed to:

- 4.5 The development of students' critical thinking, independent problem solving and performance capabilities.

Teachers engage in activities to:

- 4.8 Evaluate teaching resources and curriculum materials for their comprehensiveness, accuracy and usefulness for representing particular ideas and concepts;
- 4.9 Identify strategies to create learning experiences that make subject matter meaningful for students, address a variety of learning styles, encourage students to pursue their own interests and inquiries and help students connect their learning to personal goals;
- 4.11 Use formal and informal methods of assessment, information about students, pedagogical knowledge, and research as sources for active reflection, evaluation and revision of practice; and

Teachers value and are committed to:

- 5.3 The belief that students' strengths are the basis for growth and their errors are opportunities for learning.

New Jersey State Mathematics Standards in the course:

<http://www.corestandards.org/the-standards/mathematics>

Assignments:

Class Participation (28 points): 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 many 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.** We only have 42 hours to explore different ways to think and teach mathematics and then you need to be able to teach math on your own! We need to make the most of this limited time together.

Discussion Board Postings (14 points): Each student is required to make 7 postings on the Sakai discussion board. **The posts must occur on separate weeks, don't post them all on Week 14.** All postings should be related to the teaching and learning of mathematics, your practicum, readings, and class discussions. You will receive points for your postings if they are thoughtful and relate to class topics.

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.

Teaching Reflection (15 points): You will choose two instructional routines to teach in your practicum classroom. A list of routines will be posted in the assignment section of Sakai. These routines are meant to challenge the rote learning and algorithmic strategies that dominate math classrooms. Instead, they will be used to help students build connections between ideas and make meaning of the mathematics. The reflection should include the following: a) a description of the two routines you chose b) how it went in the classroom, including details on how the students engaged mathematically in each routine and c) a section on what you would do differently the next time you engage students in these activities. The reflection should be 2-3 pages double-spaced.

Group Lesson Plan (15 points): You will be asked to develop a lesson plan in groups *and teach approximately 10 minutes of the lesson in our class*. You will need to turn in a lesson two weeks before teaching it in class. I will then give you feedback on the lesson plan. The week before you teach it we will cover the content in class. You can use my feedback and what we cover in class to edit the lesson plan. Then you will teach it to your fellow students and they will provide feedback for you. After receiving this feedback, you will edit it again, and submit the final lesson plan for a grade. The expectation is that through these revisions you will have designed a professional quality lesson plan. The goal is to demonstrate an understanding of the pedagogy discussed in class and to make the mathematics meaningful for students. A rubric, template, and write-up examples will be posted on Sakai.

Group Curriculum Development Project (15 points): You will also revise a chapter in groups from an existing elementary mathematics curriculum. The focus of the curriculum development project is to meaningfully adopt, refine, and supplement existing curricular resources in ways that are aligned with children's mathematical thinking. A detailed description of the sequence of lessons, important content covered, instructional practices used, and forms of student assessment must be provided. Your group's project submission must highlight where and how mathematical problem solving plays a role in supporting children's learning through the curriculum sequence. Prior to the project submission, the instructor will model a sample lesson from an elementary mathematics curriculum to prepare you for your role in thinking critically about adapting curricula for teaching mathematics with understanding. You will take some time to revise the curriculum during class. I would suggest turning this in to the instructor for feedback before submitting it for a grade. A rubric and template will be posted on Sakai.

Individual Lesson Plan (30 points): From the group curriculum development project, each of you will choose one lesson to write up on your own. Using what you learned from the group lesson plan, you will need to write a detailed lesson plan that exemplifies teaching mathematics for understanding. This means you will need to detail your pedagogy and what you say within the lesson in a way that demonstrates comprehension of the principles of the course, similar to the group lesson plan.

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.

Grading policy:

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%

If you need ANY special accommodations during the course, please see me after the *FIRST* class.

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

Check Sakai on the wiki for when your group lesson plan is due.

Readings are subject to change based on what we talk about in class – any changes will be posted as an announcement on Sakai.

Class Date	Topic and Standards	Readings Due	Assignments Due
Week 1 September 3	Introduction, Problem Solving, Making Mathematics Meaningful (1.6, 1.7, 4.9)		
Week 2 September 10	Addition and Subtraction Strategies & Problem Types, Counting (1.8, 2.1, 4.1)	Sakai: Erlwanger Sakai: Skemp Sakai: Khan article CM: Introduction and Ch 1	
Week 3 September 17	Addition & Subtraction Student Strategies, Counting, Teacher Roles, Strategies for ELLs (1.4, 3.9, 4.5)	Sakai Friel MS: Ch 3 Sakai: Schwerdtfeger	
Week 4 September 24	Counting and Multi-digit Strategies, Evaluation of Teaching Resources (1.9, 2.6, 2.8, 5.3)	ELLs: Ch 2 CM: Ch 2	
Week 5 October 1	Children's Multi-digit Strategies, Mathematical Tools and Technology (2.3, 4.4, 4.5)	MS: Ch 5 Sakai: Nathan CM: Ch 3	
Week 6 October 8	Algebraic Thinking & Relational Thinking, Questioning (1.5, 1.7, 2.1)	Sakai: Earnest ELLs: Ch 6 CM: Ch 6	

Week 7 October 15	Multiplication and Division Strategies & Problem Types, Teaching for development differences (2.3, 2.7, 4.1, 4.3)	ELLs: Ch 3 Sakai: Equal Sign Sakai: Rigelman	
Week 8 October 22	Multi-digit Multiplication, Building on student lives (1.1, 2.7, 3.10)	ELLs: Ch 5 Sakai: Schoenfeld CM: Ch 4	Teaching Reflection Due
Week 9 October 29	Multi-digit Division Strategies, and Assessment Strategies (1.1, 4.3, 4.11)	Sakai: NCTM 2001 Yearbook CH17 and 18	
Week 10 November 5	Fair Sharing, Multiple Representations, Connecting Instruction to Student Lives and Culture (2.2, 1.8, 3.9, 4.9)	Sakai: Fuson MS: Ch 2	
Week 11 November 12	Fractions, Mathematizing Social Issues (1.1, 1.4, 3.10)	Sakai: Flores and Klein Sakai: NCTM 2001 Yearbook CH 5	Curriculum planning due
Week 12 November 19	Fractions, Curricular Evaluation, Social Norms (1.1, 1.8, 4.8)	MS: Ch 4 CM: Ch 7	
THERE IS NO CLASS ON NOV 26 – UNIVERSITY SCHEDULE IS THURSDAY			
Week 13 December 3	Geometry, Using Technology and Tools (1.1, 1.2, 4.4)	Sakai: Taylor-Cox ELLs: Ch 1	
Week 14 December 10	Data Analysis, Mathematizing Social Issues (1.4, 4.3, 4.9)	ELLs: Ch 7	Last Day to turn in Individual Lesson Plans

Academic Integrity

The highest standards of academic integrity are expected of all students. The failure of any student to meet these standards may result in suspension or expulsion from the university and/or other sanctions as specified in the academic integrity policies at Rutgers University.

Violations of academic integrity include, but are not limited to: cheating, fabrication, tampering, plagiarism, stealing, or facilitating such activities. The university academic integrity policies are available at the link below:

<http://academicintegrity.rutgers.edu>