

**Rutgers, The State University of New Jersey**

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**The Teaching Professional: PLC on Math Reasoning  
Spring 2016**

**Thursdays, 4:50 – 7:30 PM**

**Scott Hall 206, CAC**

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Phone Number: 848-932-0803	Location: GSE Room 232
Office Hours: Thursdays 2:00-4:00 PM (Or by appointment)	Prerequisites or other limitations: <i>Course requires field work</i>
Mode of Instruction: <input type="checkbox"/> Lecture <input type="checkbox"/> Seminar <input checked="" type="checkbox"/> Hybrid <input type="checkbox"/> Online <input type="checkbox"/> Other	Permission required: <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes Directions about where to get permission numbers: L&T Dept. Admin. Caroline Coogan

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**

This course is designed as a bridging experience between our teacher preparation program and professional teaching. During the teaching internship in the fall, you partnered with cooperating teachers and built relationships with students to teach mathematics in formal classroom settings. Yet there are other settings in which teachers can engage with members of school communities to promote inquiry-based, student-centered instruction for meaningful learning of mathematics. In this course, you will become active in a professional learning community (PLC) to focus on the development of mathematical reasoning. The course is a hybrid model that combines class sessions that meet on campus, online interactions, and activities conducted at school sites to help you build skills to (a) work collaboratively as a community of professional educators and (b) engage students in problem solving and reasoning to express justifications for solutions. You

also will complete the set of School Law for Teachers online learning modules and pass its quiz, which is a requirement for all sections of this course.

**Learning goals:**

- To gain a practical research-based set of experiences using a modified lesson study approach for teacher professional development as a community of learners
- To learn about how students develop skills in mathematical reasoning by studying video episodes in preparation for facilitating problem-solving activities with students
- To learn how to foster a classroom culture where sense making, reasoning and justification are expected behaviors (norms)
- To build skills in the professional noticing of children’s mathematical reasoning and develop practices for facilitating productive mathematical discourse
- To build deeper understanding of mathematical concepts, procedures and ways of reasoning in mathematical learning
- To gain knowledge from the six PowerPoint modules comprising the School Law Primer

**New Jersey Professional Standards for Teachers (2014)<sup>1</sup>:**

Through working towards the learning goals of this course and completing course requirements, students will be addressing several professional standards for teachers, some in greater depth than others. Specifically addressed are the Performances, Essential Knowledge and Critical Dispositions for Standard 1: Learner Development, Standard 3: Learning Environment, and Standard 9: Professional Learning. Also addressed are elements of Standard 4: Content Knowledge and Standard 5: Instructional Strategies. We will do so in light of the CCSS Standards for Mathematical Practices. Also addressed are:

**10. Standard Ten: Professional Development.**

Teachers shall participate as active, responsible members of the professional community, engaging in a wide range of reflective practices, pursuing opportunities to grow professionally and establishing collegial relationships to enhance the teaching and learning process.

*i. Teachers know and understand how education research and other methods of inquiry can be used as a means for continuous learning, self assessment and development.*

*ii. Teachers value and are committed to:*

- (1) Refining practices that address the needs of all students and the school community;
- (2) Professional reflection, assessment and learning as an ongoing process; and
- (3) Collaboration with colleagues to give and receive help.

*iii. Teachers engage in activities to:*

- (1) Use reflective practice and the Professional Development Standards to set goals for their professional development plans;
- (2) Learn through professional education organizations; and
- (3) Make the entire school a productive learning climate through participation in collegial activities.

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

### **11. Standard Eleven: Professional Responsibility.**

Teachers shall act in accordance with legal and ethical responsibilities and shall use integrity and fairness to promote the success of all students.

*i. Teachers know and understand:*

- (1) Their professional responsibilities as reflected in constitutional provisions, statutes, regulations, policies, and collective negotiations agreements; and
- (2) Strategies to foster professional and productive relationships with students and colleagues.

*ii. Teachers value and are committed to:*

- (1) Recognizing that an educator's actions reflect on the status and substance of the profession;
- (2) Upholding the highest standards of professional competence both as a practitioner in the classroom as well as an employee vested with the public trust;
- (3) Recognizing, respecting and upholding the dignity and worth of students as individual human beings, and therefore dealing with them justly and considerately; and
- (4) Recognizing their obligation to the profession of teaching and not engaging in any conduct contrary to sound professional practice and/or applicable statutes, regulations and policy.

*iii. Teachers engage in activities to:*

- (1) Promote aspects of students' well-being by exercising the highest level of professional judgment, and working cooperatively and productively with colleagues and parents to provide a safe, healthy, and emotionally protective learning environment;
- (2) Maintain the confidentiality of information concerning students obtained in the proper course of the educational process and dispense such information only when prescribed or directed by federal and/or state statutes or accepted professional practice;
- (3) Maintain professional relationships with students and colleagues;
- (4) Provide access to various points of view without deliberate distortion of subject matter; and
- (5) Foster and maintain a school environment which protects students from sexually, physically, verbally, or emotionally harassing behavior by recognizing, understanding, and conducting themselves in a sound and professionally responsible manner.

### **Course catalog description:**

This course is intended to encourage students to understand and apply key concepts associated with the transition from educational novice to educational professional. The course is broken into two parts. Part One explores the question: "How should an educational professional act in and outside of school?" Part Two asks "How do professional communities and organizations shape the work that teachers do?" The course engages questions of school law and governance, as well as teacher associations, unions, and local stakeholders. The course culminates in a professional development plan<sup>2</sup>.

### **Additional description of course purposes, context, and methods:**

This section of the course has been designed with community-based methods for becoming teaching professionals. As such, it requires that you do course work in the school communities. Some of your efforts will go towards actively shaping the communities in which you work, and our class section forms a larger community that supports what you will be doing in the schools.

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<sup>2</sup> Assignments specific to this section replace "professional development plan" in the course catalog description.

Course work to be done in the field includes implementation of three after-school sessions, each about one hour in duration: the first two for problem-solving activities and a third for follow-up discussions with students about their mathematical reasoning on the tasks. They will be spread out over the semester, tentatively scheduled for weeks four, nine and twelve. Graduate students in this course will partner with each other and with their former cooperating teachers to make arrangements for holding the after-school sessions at school sites, which includes recruiting student participants via friendly invitations for math enrichment activities (i.e., an opportunity for math learning with no test/quiz or grades). Cooperating teachers are invited to join our PLC on Math Reasoning and participate in course-related activities that interest them. Participants in the PLC will build skills in the professional noticing of student's mathematical reasoning and in facilitating productive mathematical discourse. Participants will jointly construct portfolios to document the learning of students in the after-school sessions they conduct, prepare (but not necessarily send) communications to parents that report on their child's progress as a math student, and attend carefully to ethical practices pertaining to systematic observations of learning and teaching in school settings. The instructor will facilitate all course activities, including support to graduate students in making arrangements to hold after-school sessions.

This course section is hybrid with 10 weeks that have on-campus meetings and 5 weeks when do not meet in the campus classroom. A tentative schedule has been created but it potentially may be adjusted to accommodate inclement weather and opportunities to conduct work in the schools. There also is substantial online course work to meet requirements. Online work is asynchronous and comprised of materials for the School Law Primer and for the PLC on Math Reasoning. The former consists of six PowerPoint modules and a quiz. The latter includes (a) access to reading assignments that relate to both the problem-solving tasks used in the lessons and the overall focus of students' reasoning and justification, (b) viewing video episodes of children engaged in solving the same or similar problem tasks as those explored during our class sessions, and (c) responding to discussion prompts intended to elicit teachers' reflection and discussion of the problem tasks, video clips and readings and their relevance to learning and teaching.

The mathematical problem-solving tasks used in this course come from long-term research at the Robert B. Davis Institute for Learning, where many studies have shown how they can be used for eliciting students' reasoning and justification. The tasks focus on algebraic, combinatorial and probabilistic reasoning, and through using them we will emphasize the mathematics, children's learning, and conditions of the learning environment, which is our basis for addressing standards.

**Required texts:** None – reading assignments are accessible via the course site.

### **Grading Policy**

#### **Evaluation of Written Work:**

Qualities such as clarity, conciseness, and relevance to the topic or discussion prompt are highly valued in written work, which includes online discussion and a portfolio project in this course. While online discussion is less formal, it is still important to cite the source of ideas to which you refer in your posts. All citations and references in the portfolio project should follow APA style. The following rubric guides evaluation of your contributions to the online discussions.

**Rubric for Online Discussion Forum**

	Below Expectations	Average	Above Average	Superior	Weight
<b>Content Quality of Initial Posts</b>	Post does not relate to the prompt or is missing.	Post responds to prompt but ideas are not stated clearly and/or fully elaborated. There is no reference to the literature.	Post responds to the prompt and ideas are stated relatively clearly; ideas are elaborated. There is little or vague reference to the literature.	Post responds to the prompt, ideas are stated clearly and are well elaborated, and connections to the literature are explicit.	45%
<b>Responses to classmates</b>	Does not respond to posts from classmates.	Responds to fewer than required number of classmates and responses made are not particularly meaningful or substantive.	Responds to required number of classmates, but responses are mixture of meaningful or substantive.	Responds to required number of classmates in meaningful and substantive ways.	30%
<b>Timeliness</b>	Does not submit assignment on time	N/A	N/A	Submitted assignment on time.	15%
<b>Spelling, grammar, and punctuation</b>	Significant errors in spelling, grammar, and/or punctuation detract from the clarity of communication.	Some errors in spelling, grammar, and/or punctuation, which may detract from clarity of communication.	Errors in spelling, grammar, and/or punctuation are minimal but noticeable; they do not detract from clarity of communication.	No or very few punctuation, spelling, or grammar errors.	10%

**Grading Criteria:**

Grades will be based on the quality of written work and the thoughtfulness of your contributions as both an active and a responsive member in a professional learning community engaged in course activities and assignments, which include:

- Active participation in class meetings and field work 40%
- Contributions to the online discussions 30%
- Final Portfolio project 30%

Your work in reviewing the material in the six modules for the school law primer is intended to educate you towards success in taking the quiz. It is automatically administered through Sakai one question at a time. Upon completion, it is automatically graded with 1 -100 points. Correct

True / False questions earn 3 points; correct “You Make the Call” questions earn 5 points. You may take the quiz up to 3 times with only your best score being saved. *Your effort to do the School Law Primer is acknowledged as course work, with other assignments scaled accordingly for a 3-credit course; however, it is not being factored into your grade for this course section.* Any questions you may have about those materials should be directed to Prof. John Adamus (who created them), or to Lisa Kruger, if the question regards implication of your score on the quiz for teacher licensure.

### **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.

### **Web sites:**

<https://sakai.rutgers.edu/portal> (*Specific course access on Sakai is made available to students who have officially registered for this course.*)

## **Course Requirements**

Successful completion of the course requires that you engage in all activities and complete all assignments. Specifically, you are expected to:

1. Attend and actively participate in all sessions for mathematical problem solving, discussions, etc.
2. Implement problem-solving tasks (potentially with some modification) with students in the schools. Take notes about these implementations and collect written work that records your students’ solutions.
3. Be prepared to discuss details of your implementation of the tasks in your school setting, with samples of students’ work, at our class sessions and/or via online conversations in the forum.
4. Actively participate in online discussions about course assignments (problem solving, implementations, readings and videos) by responding to guiding questions posted on the course website and to comments of your peers and instructor. *Each participant will be expected to make at least one original (initial) response posting per discussion topic and respond to at least two group member postings in that topic. **Initial posts should be made by Sunday night; Responses should be made by Wednesday night.*** Specific due dates will appear on course website.
5. Based on your observations and students’ work during the problem-solving task implementations, select one or two students whose thinking about the tasks is particularly interesting. Plan and carry out a task-based interview with the student(s) per guidelines we will develop together.
6. Prepare letter(s) for communicating with parents about their child’s mathematical learning.
7. Complete a Final Portfolio. This project should include: (1) A summary narrative of your implementation of each of the problem tasks with your students, accompanied by student work and other artifacts from the implementations; (2) An analysis of an individual task-based interview that you prepare and conduct with one (or more) student(s) toward the end of the term; (3) A copy of your letter home to parents about their child’s mathematical learning; and (4) A

reflective assessment of your work in the course. Reflect on your knowledge of the mathematics, research on how students learn, and implications for teaching with regard to NCTM and Common Core State 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.

8. Complete the School Law Primer (6 PPT modules and a quiz) as an independent assignment.

### Course Schedule and Assignments

<b>Dates</b>	<b>Activities/Topics to be Covered</b>	<b>Assignments &amp; Readings</b>
Week 1 Class meeting Jan 21	<ul style="list-style-type: none"> <li>• Introductions</li> <li>• Engage in problem-solving tasks</li> <li>• Review course requirements</li> <li>• Introduce the School Law Primer</li> </ul>	<ul style="list-style-type: none"> <li>• Alston, A., Pedrick, L., Morris, K. &amp; Basu, R. (2011). Lesson study as a tool for developing teachers' close attention to students' mathematical thinking. In L. Hart, A. Alston and A. Murato (Eds.) <i>Lesson Study Research and Practice in Mathematics Education: Learning Together</i>. Dordrecht. Springer.</li> </ul>
Week 2 Class meeting Jan 28	<ul style="list-style-type: none"> <li>• Discuss the reading by Alston et al and talk about course expectations</li> <li>• Examine samples of student work and discuss what people notice</li> <li>• Preliminary planning for Task 1</li> </ul>	<ul style="list-style-type: none"> <li>• Jacobs, V. R., Lamb, L. L. C., &amp; Philipp, R., A. (2010). Professional noticing of children's mathematical thinking. <i>Journal for Research in Mathematics Education</i>, 4(2), 169-202.</li> </ul>
Week 3 Online	<ul style="list-style-type: none"> <li>• Consider variations / extensions of tasks for accommodating students in your classroom</li> <li>• Read two book chapters about children's work on towers tasks</li> <li>• Watch videos of PUP-Math Towers and PUP-Math Gang of Four</li> <li>• Participate in online discussion (details appear on Sakai site)</li> <li>• Planning for Task 1 that includes questions to elicit student reasoning</li> </ul>	<ul style="list-style-type: none"> <li>• Maher, C. A., Sran, M. &amp; Yankelewitz, D. (2010). Towers: Schemes, Strategies, and Arguments. In C. A. Maher, A. B. Powell, &amp; E. B. Uptegrove (Eds.), <i>Combinatorics and Reasoning: Representing, Justifying, and Building Isomorphisms</i> (pp. 27-44). Springer: New York, NY.</li> <li>• Tarlow, L. D. &amp; Uptegrove, E. B. (2010). Block Towers: Co-Construction of Proof. In C. A. Maher, A. B. Powell, &amp; E. B. Uptegrove (Eds.), <i>Combinatorics and Reasoning: Representing, Justifying, and Building Isomorphisms</i> (pp. 97-104). Springer: New York, NY.</li> </ul>
Week 4 Field work and Class meeting Feb 11	<ul style="list-style-type: none"> <li>• Task implementations in schools</li> <li>• Engage in follow-up discussions</li> <li>• Examine samples of students' work</li> </ul>	<ul style="list-style-type: none"> <li>• Organize artifacts from task implementations</li> <li>• Begin identifying samples for inclusion in portfolios</li> </ul>

Week 5 Online	<ul style="list-style-type: none"> <li>Consider how first task leads into development of other math ideas</li> <li>Read journal article</li> <li>Watch three video clips (see Sakai)</li> <li>Participate in online discussion</li> </ul>	<ul style="list-style-type: none"> <li>Maher, C. A. &amp; Speiser, R. (1997). How far can you go with block towers? Stephanie's Intellectual Development. <i>The Journal of Mathematical Behavior</i>, 16(2), 125-132.</li> </ul>
Week 6 Class meeting Feb 25	<ul style="list-style-type: none"> <li>Share and discuss examples of students' work from Task 1</li> <li>Talk about the portfolio project</li> <li>Engage in problem-solving tasks</li> <li>Reminder re: School Law modules</li> </ul>	<ul style="list-style-type: none"> <li>Reflection on own problem solving and key math ideas</li> <li>Allotted time for working on School Law modules</li> </ul>
Week 7 Class meeting March 3	<ul style="list-style-type: none"> <li>Preliminary planning for Task 2</li> <li>Consider variations / extensions of tasks for accommodating students in your classroom</li> <li>Assignment to read book chapter and study videos PUP-Math Pizzas</li> <li>Extend task planning into online discussion</li> </ul>	<ul style="list-style-type: none"> <li>Maher, C. A., Sran, M. &amp; Yankelewitz, D. (2010). Making Pizzas; Reasoning by Cases and by Recursion. In C. A. Maher, A. B. Powell, &amp; E. B. Uptegrove (Eds.), <i>Combinatorics and Reasoning: Representing, Justifying, and Building Isomorphisms</i> (pp. 57-72). Springer: New York, NY.</li> </ul>
Week 8 Online	<ul style="list-style-type: none"> <li>Continued planning for Task 2</li> <li>Read two book chapters about older children's work on pizza problems</li> <li>Watch videos of 11<sup>th</sup> graders working on pizza problems</li> <li>Participate in online discussion</li> </ul>	<ul style="list-style-type: none"> <li>Muter, E. M. &amp; Uptegrove, E. B. (2010). Representations and Connections. In C. A. Maher, A. B. Powell, &amp; E. B. Uptegrove (Eds.), <i>Combinatorics and Reasoning: Representing, Justifying, and Building Isomorphisms</i> (pp. 105-120). Springer: New York, NY.</li> <li>Tarlow, L. D. (2010). Block Towers: Co-Construction of Proof. In C. A. Maher, A. B. Powell, &amp; E. B. Uptegrove (Eds.), <i>Combinatorics and Reasoning: Representing, Justifying, and Building Isomorphisms</i> (pp. 121-132). Springer: New York, NY.</li> </ul>
<b>Spring Break</b>		
Week 9 Field work and Class meeting March 24	<ul style="list-style-type: none"> <li>Task implementations in schools</li> <li>Engage in follow-up discussions</li> <li>Examine samples of students' work</li> <li>Share and discuss examples of students' work from Task 2</li> </ul>	<ul style="list-style-type: none"> <li>Organize artifacts from task implementations</li> <li>Identify samples for inclusion in portfolios</li> <li>Allotted time for working on School Law modules</li> </ul>
Week 10 Class meeting March 31	<ul style="list-style-type: none"> <li>Introduce ideas of clinical interview</li> <li>Discuss assignment re: conducting interviews with 1 or 2 students</li> <li>Assign Ginsburg chapter and video of PUP-Math Brandon Interview,</li> </ul>	<ul style="list-style-type: none"> <li>Ginsburg, H. (1997). Not a cookbook: Guidelines for conducting a clinical interview. In H. Ginsburg, <i>Entering the Child's Mind</i> (pp. 115-158). Cambridge</li> </ul>

	with online discussion	University Press: Cambridge, U.K.
Week 11 Class meeting Online	<ul style="list-style-type: none"> <li>• Develop guidelines for conducting student interview(s)</li> <li>• Review initial work on portfolio projects and offer suggestions</li> <li>• Assign journal article for online discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Francisco and Maher (2011). Teachers Attending to Students' Mathematical Reasoning: Lessons from an after-school research program. <i>Journal of Mathematics Teacher Education</i>, 14(1), 49-66.</li> </ul>
Week 12 Class meeting April 14	<ul style="list-style-type: none"> <li>• Conduct student interview(s) per scheduled visit to school site</li> <li>• Continue work on portfolio project</li> <li>• Read article and discuss online</li> <li>• Allot time for School Law modules</li> </ul>	<ul style="list-style-type: none"> <li>• Maher, C. A., Landis, J. H. &amp; Palius, M. F. (2010). Teachers attending to students' reasoning: Using videos as tools. <i>Journal of Mathematics Education</i> 3(2), 1-24.</li> </ul>
Week 13 Online	<ul style="list-style-type: none"> <li>• Continue work on portfolios</li> <li>• Complete School Law modules</li> </ul>	<ul style="list-style-type: none"> <li>• Select portfolio excerpts for sharing at last class meeting</li> </ul>
Week 14 Class meeting April 28	<ul style="list-style-type: none"> <li>• Share and discuss excerpts from portfolio projects</li> <li>• Reflect on participating in cycles of Lesson Study on Math Reasoning</li> </ul>	<ul style="list-style-type: none"> <li>• Finalize and submit portfolio projects</li> <li>• Last opportunity to re-take quiz for School Law Primer for final score</li> </ul>
Week 15	<ul style="list-style-type: none"> <li>• End of Semester</li> <li>• Portfolios submitted</li> <li>• School Law quiz final score taken</li> </ul>	