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Analysis of Mathematics Curriculum I
Spring 2015
Tuesdays 4:50 – 7:30 PM
GSE Room 211, CAC

Instructor: Marjory F. Palius	Email: marjory.palius@gse.rutgers.edu
Phone Number: 848-932-0803	Location: GSE Room 232
Office Hours: Tuesdays 3:00 - 4:30 PM (or by appointment)	Prerequisites or other limitations: none
Mode of Instruction: ___ Lecture ___ Seminar _X__ Hybrid ___ Online ___ Other	Permission required: __ No _X_ Yes Directions about where to get permission numbers: email to 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: hhttps://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

Learning goals:

- To develop a perspective on mathematics instruction embedded in problem solving as a means to integrate functional and structural understanding and engage students at all ages
- To view mathematics curricula as opportunities for teachers to problematize situations for their students to make sense of mathematical concepts and procedures through personally meaningful strategies and reasoning that can be shared and discussed in the classroom
- To provoke consideration of the way that mathematical topics are introduced through close and critical examination of the Common Core State Standards for Mathematics and how curriculum and instruction are informed by research on learning trajectories
- To become familiar with a variety of curricular materials for mathematics instruction, including texts and digital resources

Course catalog description:
This course takes a close and critical look at K-12 mathematics curricula in light of current recommendations for curricula, teaching and learning.

Additional description of course purposes, context, and methods:
This course is required for students admitted to the Ed.M. program in mathematics education in the Fall 2013 term onwards and is an elective for all other students. The course is hybrid format, combining on-campus meetings with substantial online activities to fulfill course requirements. Our purpose is to look at the big picture of K-12 mathematics through analysis of curriculum and instruction. We do this by first developing a perspective on mathematics instruction as problem solving, unpacking what that means with regard to student learning and the role of the teacher. Through readings from the research literature and illustrative video examples, we will build ideas about how teachers can problematize situations, even seemingly mundane ones, for students to engage in mathematical learning. We will consider problem-solving tasks and, more importantly, aspects of classroom environments that enable students to make sense of mathematical concepts and procedures by using and discussing personally meaningful strategies and ways of reasoning. We will consider the role of the teacher in enacting the curriculum, attending to students' thinking and facilitating classroom discourse. From this perspective, we will critically examine recommendations for K-12 mathematics curricula and how topics are introduced in the Common Core State Standards for Mathematics. The process includes becoming familiar with a variety of curricular resources for mathematics instruction, including texts and digital programs, to consider how materials can be used in their current form, or perhaps transformed, for problem solving in the classroom. Students will do a project (individual or collaborative) to demonstrate their understanding of how to problematize mathematics and prepare for classroom enactment of activities by selecting a topic of their choosing and planning for its teaching using lesson play.

Required texts: Common Core State Standards for Mathematics (CCSS-M), to be downloaded from http://www.corestandards.org/Math/. All other readings are accessible via course web site.

Grading Policy

Evaluation of Course 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 project work 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 project work should follow APA style. Participation in class includes contributing to seminar topics and critical examination of curricular materials.

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 of a community of professional learners in this course through activities that include:

Participation in the on-campus class meetings	40%
Participation in the online discussions	40%
Course project	20%

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 on-campus sessions for mathematical problem solving, discussions, collaborations, etc.

2. Actively participate in online discussions to critically reflect on our class-based activities, assigned readings, etc. by responding to guiding questions posted on the course website and to comments of your peers and instructor. Each participant is expected to make at least one original response posting per discussion topic and respond to at least two group member postings in that topic. Some weeks there will be only one topic of discussion; other weeks there may be a couple topics. Specific due dates appear on course website.

3. Be willing to share examples of curricular materials currently in use or being considered for use in your school / district. Such materials may include texts, problem-solving activities, curriculum guides, and/or web-based resources.

4. Complete a project based on using lesson play to plan for teaching. Students will do a project, either working as an individual or in a collaborative, that addresses the concepts and frameworks we explored together in this course. Projects show your understanding of how to problematize mathematics and prepare for enactment of activities in the classroom by choosing topic of interest and planning for its teaching using features of lesson play. Projects will be shared during the last class session(s) and are due as an *electronic submission* by 11:59 PM on Friday, May 8.

5. Submit a short (1-2 page) reflection paper about what you learned in the course. This is an ungraded assignment but required nevertheless. Submit electronically by May 10.

Attendance Policy:
Students are required to attend all class sessions and participate regularly during online sessions. Instances of severe weather may result in changing our schedule to switch on-campus meetings for online sessions, in which case you will be informed via email sent from course site on Sakai. If special circumstances (religious observance, school open house, illness) require absence, students are responsible to inform the instructor beforehand and to make up all work. It is suggested that each student identify a partner who can assist when one is unable to attend class.

Course Schedule and Assignments

In addition to the assigned readings, there will be online discussions every week. Students should make their initial posts by Friday night, if possible, or by 12 Noon Saturday at the latest. That gives others opportunity to respond over the weekend with online discussion assignments due by 10 AM Monday. This regular schedule gives the instructor time to review, respond and plan for carrying forward key discussion points from week to week so that activities flow well. ***The following schedule is tentative*** *and may be adjusted as the course proceeds, with specific assignments clarified each week on the Sakai site.*

Weeks	Activities/Topics to be Covered	Reading Assignments
Jan 20	• Introductions • Course Overview • Discuss views of curriculum and what it entails	Remillard, J. T. & Heck, D. J. (2014). Conceptualizing the curriculum enactment process in mathematics education. *ZDM Mathematics Education 46*, 705–718.
Jan 27	• Continue discussing curriculum enactment and role of the teacher • Share ways in which you are involved with curriculum design and development at your school • Critical review and discussion of the CCSS-Math, beginning with how Standards for Mathematical Practices are rooted historically in the standards movement that led to the NCTM Standards	Maher, C. A. (1988). The teacher as designer, implementer, and evaluator of children's mathematical learning environments. *The Journal of Mathematical Behavior,* 6, 295-303. Maher, C. A., Davis, R. B. & Alston, A. (1991). Implementing a "thinking curriculum" in mathematics. *The Journal of Mathematical Behavior, 10*(3), 219-224.
Feb 3	• Discuss the role of problem solving in mathematics curriculum and instruction – How is it framed in the CCSS-Math? • Share current practices, curriculum guides, texts, resource materials • Explore materials at the RBDIL	Hiebert, J., Carpenter, T.P., Fennema, E., Fuson, K., Human, P., Murray, H., Olivier, A., & Wearne, D. (1996). Problem solving as a basis for reform in curriculum and instruction: The case of mathematics. *Educational Researcher, 25*(4), 12-21. Gravemeijer, K. & van Galen, F. (2003). Facts and algorithms as products of students' own mathematical activity. In J. Kilpatrick, W. Martin & D. Schifter (Eds.) *A Research Companion to Principles and Standards for School Mathematics* (pp. 114-122). Reston, VA:

		National Council of Teachers of Mathematics.
Feb 10	• Discuss the nature of mathematical tasks for eliciting student thinking and reasoning • What guidance appears in the CCSS-Math? What other resources seem to be helpful? Review, discuss and share/explore curricular materials	Henningsen, M. & Stein, M. K. (1997). Mathematical tasks and student cognition: Classroom-based factors that support and inhibit high-level mathematical thinking and reasoning. *Journal for Research in Mathematics Education, 28*(5), 524-549.
Feb 17 Online	• View videos illustrating students problem solving and reasoning • Discuss features of task design, the role of the teacher, and the nature of students' interactions • Relate observations to CCSS-Math for content standards and practices	Mueller, M., Yankelewitz, D. & Maher, C. (2010). Promoting student reasoning through careful task design: A comparison of three studies. *International Journal for Studies in Mathematics Education, 3*(1), 135-16.
Feb 24 Online	• View videos illustrating students problem solving and reasoning • Discuss key features of the learning environment and their impact • Relate observations to CCSS-Math for content standards and practices	Francisco, J. M. & Maher, C. A. (2005). Conditions for promoting reasoning in problem solving: Insights from a longitudinal study. *The Journal of Mathematical Behavior,* 24(3-4), 361-372.
Mar 3	• Discuss what constitutes productive discussion in math class and what teachers can do to facilitate it • Share successes and challenges from your own experiences • How, if at all, does verbalization of mathematical ideas lead to writing explanations and justifications?	Stein, M. K., Engle, R. A., Smith, M. S. & Hughes, E. K. (2008). Orchestrating productive discussions: Five practices for helping teachers move beyond show and tell. *Mathematical Thinking and Learning, 10*, 313-340.
Mar 10	• Preparing for curriculum enactment by planning teaching: What might it look like? • Introduce lesson plays and the course project • Share initial ideas and invite collaboration on related topics	Zaskis, R., Liljedehl, P. & Sinclair, N. (2009). Lesson plays: Planning teaching versus teaching planning. *For the Learning of Mathematics, 29*(1), 40-47.
Mar 17	• SPRING BREAK	
Mar 24 Online	• View videos illustrating expert teacher questioning in classroom and/or interview settings • Discuss the nature of their skills at asking questions with reference to both conversational features and knowledge of students and math	Martino, A.M. & Maher, C.A. (1999). Teacher questioning to promote justification and generalization in mathematics: What research practice has taught us. *The Journal of Mathematical Behavior, 18(1),* 53-78.

Mar 31	• Discuss the construct of learning trajectories (or progressions) for mathematics and its research basis • Examine curriculum mapping with learning trajectories defined on it • Share experiences from teaching particular subjects, grade levels • Examine texts, curriculum guides to see how topics are sequenced • Engage in critical discussion	Confrey, J. (2012). Articulating a learning sciences foundation for learning trajectories in the CCSS-M. In L. R. Van Zoest, J. J. Lo, & J. L. Kratky (Eds.), *Proceedings of the 34th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 2-22. Kalamazoo, MI: Western Michigan University.
Apr 7	• Continue discussion of learning trajectories in mathematics • Begin to consider implications for teaching: How might knowledge of learning trajectories impact planned and enacted curricula?	Stazjin, P., Confrey, J., Wilson, P. H., & Edgington, C. (2012). Learning trajectory based instruction: Toward a theory of teaching. *Educational Researcher, 41*(5) 147–156.
Apr 14	• Critically examine sequencing of topics in mathematics curricula • Compare and contrast a variety of materials • Consider whether some topics should be introduced earlier, later, or in a different manner	Coles, A. (2014). Ordinality, neuroscience and the early learning of number. In Nicol, C., Oesterle, S., Liljedahl, P., & Allan, D. (Eds.). (2014), *Proceedings of the Joint Meeting of PME 38 and PME-NA 36*. Vancouver, Canada: PME.
Apr 21	• Consider how technology can transform mathematical instruction with digital curricula and tools • Discuss implications for practice	Sinclair, N. & Heyd-Metzuyanim, E. (2014). Learning number with TouchCounts: The role of the emotions and the body in mathematical communication. *Technology, Knowledge and Learning 19*, 81-99.
Apr 28	• Discuss topic(s) TBA / open forum • Presentations to share projects	Online discussions, continue work on projects, possible reading TBA
May 5	• Presentations to share projects • Culminating discussions	• Final projects due by May 8 • Reflection papers due by May 10