

Methods & Techniques: Mathematics
MSED 457 | TEACH ED 357

Northwestern University, Fall Quarter, 2021
School of Education and Social Policy

Wednesdays, 6:00 - 9:00 p.m.

Annenberg G22

INSTRUCTOR

James Lynn

- **Email:** james.lynn@northwestern.edu
- **Office Hours:** Wednesdays, 5:00-6:00 p.m. and by appointment

COURSE OVERVIEW

The goal of this course is to help you develop the knowledge, skills, and dispositions to teach high school mathematics in a way that supports meaningful student learning. Mathematics teaching is a complex task that involves close attention to the mathematical features and affordances of individual tasks and the learning trajectory across a series of tasks; to the ideas and strategies that students use as they work on these tasks; and to the role of the teacher in supporting students' exploration and discussion of these ideas. Furthermore, teachers need to know how to effectively reflect on lessons and learn from their ongoing experiences.

As part of this class, you will have the opportunity to engage in mathematics, to study video and student work from math lessons, and to plan math lessons. Through a variety of class activities, you will rehearse several key aspects of classroom interactions, including launching a task, supporting students' investigations, and debriefing an activity through orchestration of a whole class discussion.

The most effective teachers are those who continue to learn long after they receive their initial teaching credentials. I hope that through this class, you will develop key tools you can use as you begin your career as a teacher, as well as resources that will support you in becoming a life-long teacher-learner.

COURSE OBJECTIVES

Course objectives are consistent with the Northwestern Teacher Education Vision and Guiding Principles (see below). The course also explicitly addresses many of the Illinois Professional Teaching Standards (IPTs).

1. To view mathematics teaching as a dynamic activity that requires close attention to students' thinking (IPTs #3, #7)
2. To view learning as a process resulting from active engagement with the learning environment (IPTs #4, #5)
3. To view mathematics proficiency as requiring both procedural fluency and conceptual understanding (IPTs #5)
4. To enhance one's subject matter knowledge and pedagogical content knowledge in order to design and implement effective instruction (IPTs #2)
5. To be able to use the classroom a context for reflection and learning (IPTs #7);
6. To conduct oneself in a professional and ethical manner in working with students at a school site (IPTs #9)

NORTHWESTERN TEACHER EDUCATION VISION & GUIDING PRINCIPLES

VISION: DEVELOPING EDUCATORS TO ENGAGE IN TRANSFORMATIVE TEACHING AND LEARNING

Northwestern University Teacher Education is committed to developing a community of educators—including aspiring teachers, faculty/staff, instructors, supervisors, mentor teachers, and teacher leaders-- of the highest caliber who see teaching as a scholarly, complex endeavor that requires an understanding of the intertwined nature of theory and practice. Our vision of transformative teaching and learning holds aspirations to develop educators who can nurture the learning of all of their students through valuing the multiple knowledges, identities and experiences that they bring with them to class and by utilizing learner-centered pedagogies. Our vision also includes the development of educators who have the capacity to design transformative educational experiences that prepare their students to contribute to social and cultural transformation. Our program helps to develop teachers who are able to nurture empathetic and productive relationships with their students, families, communities, and colleagues.

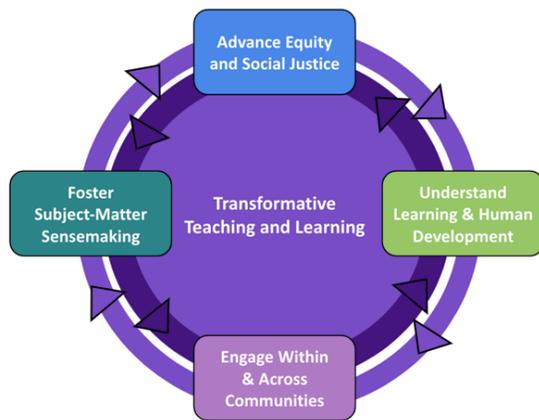
We will achieve our vision of developing transformative educators by collaborating with our educational community to advance a set of intersecting themes, which we refer to as our Guiding Commitments. The purpose of our Guiding Commitments is to provide the conceptual building blocks to develop a teacher education program that nurtures beliefs in educational dignity and equity along with the ability to create classroom interactions that enact those beliefs. The building blocks form a structure where transformative teaching and learning is constructed by the intersecting ideas of equity & social justice, subject-matter sensemaking, learning and human development, and engagement within and across

communities. These themes and their relationship to one another are articulated through the bullets below, accompanied by the graphical representation that follows.

Northwestern Teacher Education: Guiding Commitments for Developing Educators to Engage in Transformative Teaching and Learning

Northwestern Teacher Education Guiding Commitments as:

- A statement of values about education for dignity, theories of learning as a social, cognitive, ethical and cultural process, and belief in the power of practices that create culturally sustaining and anti-racist learning environments
- Tools for strengthening our cultural life living through Course, “Discipline”, Program, Community
- Opportunities to build knowledge, enact practices/ performances, cultivate dispositions



ADVANCE EQUITY AND SOCIAL JUSTICE

Great educators have both a strong understanding of their own cultural identities and value the cultural contexts and identities of their students as tools to support development and learning. They draw on these understandings to create relevant, connected and equitable learning experiences with their students. Educators must learn to design and provide the varied materials, questions, goals, and supports that each student needs. At the same time we must acknowledge that teaching and learning is situated in various systems ranging from families to communities, and we must work to understand and challenge systems that

perpetuate inequality. Our teacher education programs strive to assist educators in doing this foundational and complex work by developing the following ideas and practices:

- Develop and demonstrate awareness of one's own internalized biases and positional privileges and recognize that identity awareness and development are ongoing
- Demonstrate a recognition that teaching grounded in equity and social justice is essential in any setting and in the teaching of all subject matter
- Identify how various forms of systemic inequity (structural, cultural, political, historical) and local policy show up in classrooms and schools, and work towards reversing these various forms of inequity
- Understand, model, and learn to enact culturally relevant and sustaining pedagogies that engage students in exploration of social issues through the lens of varied perspectives and identities
- Cultivate interactions that demonstrably value all students and colleagues and their ideas including knowing how to facilitate difficult conversations and how to respond to various expressions of bigotry
- Understand and draw on the assets of students, colleagues, and their surrounding communities by eliciting their experiences from both in and out of school

FOSTER SUBJECT MATTER SENSEMAKING

We strive to develop educators with robust understandings of subject matter that can be applied in interdisciplinary ways to the world and their student's lives. These educators understand the importance of always being conscious that the way one thinks about learning informs the way one teaches. And because this is true, they are interested in studying the learning of subject matter based on their students' ideas and the literature. Knowing how students understand disciplinary ideas is an essential part of effective teaching and differentiating supports. It is also essential to recognize that subject matter ideas are always culturally situated. Educators in our programs will develop pedagogical content knowledge and practice that is primarily informed by the following ideas:

- View subject matter as sets of ideas that form both content and pedagogical process for making sense of the world; engage in sensemaking as learners
- Identify as learners and sensemakers who engage in strengthening their own subject matter knowledge and pedagogical practice
- Notice, understand and respond to student thinking in order to encourage meaning making within and across disciplines
- Recognize that the way learning environments are designed will elicit and privilege particular ways of knowing

- Engage in subject matter teaching as an iterative, interdisciplinary, and reflective process of design that involves the creative and skillful use of materials and resources, including technological tools
- Implement inquiry and other pedagogical approaches that reflect understanding knowledge as socially and culturally constructed
- Utilize formative and summative assessment practices that contribute to students' growth
- Examine and address standards within disciplinary areas as a way to both shape and determine content and expectations

UNDERSTAND LEARNING AND HUMAN DEVELOPMENT

We recognize that the way that educators understand learning and human development is one of the most significant influences on their decisions about instructional strategies, curriculum design, and classroom interactions. The awareness that teachers hold of the complexities of the process of human development influences their ability to engage in positive and productive relationships, address the learning needs of each student whom they serve; it also shapes the way they conceive of evidence about progress and learning. At the same time, educators need to commit to a reflective stance towards their own growth and development based on relevant forms of data. Towards that end, we will work with our community of educators to:

- Understand how theories of learning and development were established and how their enactment is complicated within powered and contradictory systems of schooling
- Understand and enact theories of learning that consider content-area knowledge as being formed by developmental, social, cultural, ethical, and political processes
- Engage in the study of human development as a process of maturation within a network of areas: physical, psychological, emotional and cultural
- Consider human development through an asset-based, iterative, perspective
- Apply systematic and reflective approaches to understanding learning as a function of social, cultural and ecological interactions within contexts
- Become facile at interpreting and evaluating data that influence learning about and improving schools by leveraging relationships between local, state and federal policies and understanding levers for changes

ENGAGE WITHIN AND ACROSS COMMUNITIES

We recognize teaching and learning as socially mediated experiences that are nested in multiple communities of learning that hold various funds of knowledge. These include

classroom and school communities, the communities of our students and families, as well as broader professional communities. Establishing meaningful and reciprocal relationships and being in community with others is contingent upon developing awareness of self and how to negotiate with others across multiple spaces of participation. We are committed to developing the knowledge and the pedagogical skills to support educators for the multiple communities in which they engage, which include:

- See schools, families, and communities as particular types of intersecting systems within a larger ecosystem that shape our students' lives
- Develop a repertoire of self-awareness and self-management skills that support effective relationships and decision making in communities of practice
- Design, establish, and maintain an environment and norms that center students' needs and ideas and fosters a sense of belonging
- Facilitate meaningful discourse and interactions where all members of a community can meaningfully participate and where ideas are encouraged and welcomed
- Establish asset-based, trusting authentic relationships with students and families in service of learning
- Communicate and function with colleagues ethically, responsively and productively
- Participate in professional learning communities as a mechanism for teacher scholarship toward continual individual growth and leadership
- Identify and leverage the formal and informal learning that occurs outside schools
- Engage in learning about the landscape, histories, challenges, assets, and resources of a community in which a school resides to inform relational and instructional interactions with students and families

REQUIRED TEXTS

- Smith, M.S. & Stein, M.K. (2018). *5 Practices for Orchestrating Productive Mathematics Discussion, 2nd edition*. National Council of Teachers of Mathematics, Reston, VA.

Paperback – ISBN 978-1-68054-016-1 \$30.95

E-book – ISBN 978-0-87353-801-5 \$27.96

Note: Purchasing the 1st edition of the book is acceptable.

Paperback – ISBN 978-1-45220-290-7 (prices vary)

- Horn, I. S. (2012). *Strength in Numbers: Collaborative learning in secondary mathematics*. National Council of Teachers of Mathematics, Reston, VA.

Paperback – ISBN 978-0-87353-663-9 \$29.95

E-book – ISBN 978-0-87353-821-3 \$27.96

Additional weekly readings will be provided via Canvas.

CLASS ASSIGNMENTS & GRADING

Assignments

- **Response Papers** - You are expected to complete the assigned readings each week. In addition, for at least six (6) weeks of the course, you should comment on the readings in a brief (approximately) one-page “response paper.” [Format specifications: single space, 1-inch margins, 11- or 12-point font.] Note that there is no response paper for the last week, Week 10; please plan accordingly. The purpose of the response paper is not for you to simply summarize the readings. Instead, you should synthesize several of the ideas raised in the readings and draw connections among different readings. You may also want to make one or two connections or raise a question or two that the readings prompted for you, perhaps in connection with your own experiences as a (math) student or with respect to your preparation to become a math teacher.
Response papers should be posted on Canvas by 8am on Wednesdays.
 - [Week 2 Response Paper](#)
 - [Week 3 Response Paper](#)
 - [Week 4 Response Paper](#)
 - [Week 5 Response Paper](#)
 - [Week 6 Response Paper](#)
 - [Week 7 Response Paper](#)
 - [Week 8 Response Paper](#)
 - [Week 9 Response Paper](#)
- **Weekly "Teaching of Math" Assignments** - In addition to weekly readings, there will be an assignment each week related to the teaching and learning of mathematics. For example, this might involve analyzing a piece of student work or planning for a classroom discussion. Assignments will be discussed in class each week and will also be

posted on Canvas. The due date/time of each assignment will be posted on Canvas, typically Wednesdays at 8 am.

- [Analyzing Lesson Vignettes](#)
 - [Analyzing the Cognitive Demand of Math Tasks](#)
 - [Task Modification Activity](#)
 - [Planning to Teach "The Swimming Pool Task"](#)
 - [Analyzing Student Work for "The Bike Ride Task"](#)
 - [Categorizing Classroom Discourse Excerpts](#)
 - [Planning for a Whole-Class Discussion of "The Speeding Car Activity"](#)
 - Lesson Planning Activity - Preparing to Co-teach a Lesson
- **Analyses of Teaching & Learning** - For this activity, you will analyze classroom video, responding to specific prompts related to mathematics teaching and learning. There will be two of these video analysis assignments to complete as homework assignments across the quarter.
 - [Classroom Video Analysis #1](#)
 - [Classroom Video Analysis #2](#)

- **Launching a Task** - An important focus of our class is the *Thinking Through a Lesson Protocol* (adapted from Smith, Bill & Hughes, 2016). The protocol highlights three key aspects of mathematics instruction: a) selecting and launching a math activity, b) supporting students' exploration/investigation of a math activity and c) debriefing an activity through orchestration of a whole-class discussion. We will explore all three of these activities in depth across the quarter.

As part of this work, you will "launch" a task in class. Prior to your launch, you will submit a launch plan to the instructor for review and feedback. The launches will typically involve a math task that we utilize in a particular class, and thus will be spread across different weeks in the quarter. Sign-ups for planning and delivering a launch across the quarter will take place in class.

- [In-Class Launch - Draft Launch Plan](#)
 - [In-Class Launch - Final Launch Plan & Launch Delivery](#)
- **Final Project**

As a final project for the class, you will prepare to teach a mathematics lesson. The instructor will provide a series of tasks from which you may choose, or you may choose a task from another source, pending instructor approval. You will create a plan

for the implementation of the activity/task and then deliver an abbreviated version of your lesson during our final class meeting. Your peers in the class will serve as students as you deliver the lesson.

- Nov. 10 – Mathematical task selection due (i.e., for the task you will feature in your lesson).
 - Dec. 1 – Final project / complete lesson plan write-up due. Post to Canvas by 6:00 p.m.
 - Dec. 1 – Present a condensed version (max. 30 mins) of your lesson in class. Your classmates will serve as the student audience for your lesson.
-
- [Final Project - Part 0: Submit your task selection for the lesson](#)
 - [Final Project - Part 1: Planning the lesson](#)
 - [Final Project - Part 2: Delivering the lesson](#)

Grades

It is expected that you will complete all course assignments and attend all class sessions at NU. You are also expected to participate in class discussions and activities each week.

Assignments will be graded using the following categories: High Proficiency, Proficient, Approaching Proficiency, Minimum Standards Not Met.

A course grade will be determined based on the following categories and weightings:

- Weekly assignments (weekly "teaching of math" assignments, response papers) - 40%
- Classroom video analyses, lesson planning and in-class teaching rehearsals (video analyses, launch planning & delivery, preparing to co-teach a lesson, final project) - 40%
- Class participation and contribution to learning environment - 20%

COURSE SCHEDULE

[See course Home Page for Course Schedule.](#)

POLICIES

- **Student Attendance Policy:** Active attendance and participation in the class is required. If you must miss a class session for any reason, please contact the instructor in advance. When missing a class, you should expect to make up the missed instructional minutes by completing any missed assignments or engaging in alternate activities as assigned by the instructor. Absences or tardiness may result in a lower course grade. With three or more absences, you may be unable to complete the class.
- **Academic Integrity:** Students in this course are required to comply with the policies found in the booklet, "Academic Integrity at Northwestern University: A Basic Guide." All papers submitted for credit in this course must be submitted electronically unless otherwise instructed by the instructor. Your written work may be tested for plagiarized content. For details regarding academic integrity at Northwestern or to download the guide, visit: <https://www.northwestern.edu/provost/policies/academic-integrity/index.html>.
- **Accessibility Statement:** Northwestern University is committed to providing the most accessible learning environment as possible for students with disabilities. Should you anticipate or experience disability-related barriers in the academic setting, please contact AccessibleNU to move forward with the university's established accommodation process (accessiblenu@northwestern.edu; 847-467-5530). If you already have established accommodations with AccessibleNU, please let me know as soon as possible, preferably within the first two weeks of the term, so we can work together to implement your disability accommodations. Disability information, including academic accommodations, is confidential under the Family Educational Rights and Privacy Act.
- **COVID-19 Classroom Expectations Statement:** Students, faculty, and staff must comply with University expectations regarding appropriate classroom behavior, including those outlined below and in the [COVID-19 Code of Conduct](#). With respect to classroom procedures, this includes:

Policies regarding masking and social distancing evolve as the public health situation changes. Students are responsible for understanding and complying with current masking, testing, Symptom Tracking, and social distancing requirements.

In some classes, masking and/or social distancing may be required as a result of an Americans with Disabilities Act (ADA) accommodation for the instructor or a student

in the class even when not generally required on campus. In such cases, the instructor will notify the class.

No food is allowed inside classrooms. Drinks are permitted, but please keep your face covering on and use a straw.

Faculty may assign seats in some classes to help facilitate contact tracing in the event that a student tests positive for COVID-19. Students must sit in their assigned seats.

If a student fails to comply with the [COVID-19 Code of Conduct](#) or other University expectations related to COVID-19, the instructor may ask the student to leave the class. The instructor is asked to report the incident to the Office of Community Standards for additional follow-up.

- **COVID-19 Testing Compliance Statement:** To protect the health of our community, Northwestern University requires unvaccinated students who are in on-campus programs to be tested for COVID-19 twice per week.

Students who fail to comply with current or future COVID-19 testing protocols will be referred to the Office of Community standards to face disciplinary action, including escalation up to restriction from campus and suspension.

- **Exceptions to Class Modality:** Class sessions for this course will occur in person. Individual students will not be granted permission to attend remotely except as the result of an Americans with Disabilities Act (ADA) accommodation as determined by AccessibleNU.

Maintaining the health of the community remains our priority. If you are experiencing any symptoms of COVID do not attend class and update your Symptom Tracker application right away to connect with Northwestern's Case Management Team for guidance on next steps. Also contact the instructor as soon as possible to arrange to complete coursework.

Students who experience a personal emergency should contact the instructor as soon as possible to arrange to complete coursework.

Should public health recommendations prevent in person class from being held on a given day, the instructor or the university will notify students.

- **Guidance on Class Recordings:** This class or portions of this class will be recorded by the instructor for educational purposes. Your instructor will communicate how members of the class can access the recordings. Portions of the course that contain images, questions, or commentary/discussion by students will be edited out of any recordings that are saved beyond the current term.
- **Prohibition of Recording Classes by Students:** Unauthorized student recording of classroom or other academic activities (including advising sessions or office hours) is prohibited. Unauthorized recording is unethical and may also be a violation of University policy and state law. Students requesting the use of assistive technology as an accommodation should contact [AccessibleNU](#). Unauthorized use of classroom recordings – including distributing or posting them – is also prohibited. Under the University’s [Copyright Policy](#), faculty own the copyright to instructional materials – including those resources created specifically for the purposes of instruction, such as syllabi, lectures and lecture notes, and presentations. Students cannot copy, reproduce, display, or distribute these materials. Students who engage in unauthorized recording, unauthorized use of a recording, or unauthorized distribution of instructional materials will be referred to the appropriate University office for follow-up.
- **Support for Wellness and Mental Health:** Northwestern University is committed to supporting the wellness of our students. Student Affairs has multiple resources to support student wellness and mental health. If you are feeling distressed or overwhelmed, please reach out for help. Students can access confidential resources through the Counseling and Psychological Services (CAPS), Religious and Spiritual Life (RSL) and the Center for Awareness, Response and Education (CARE). Additional information on all of the resources mentioned above can be found here:

<https://www.northwestern.edu/counseling/>

<https://www.northwestern.edu/religious-life/>

<https://www.northwestern.edu/care/>