

IL 3475
Professional Learning in STEM
Fall Term 2021

Course Instructor



Mary Kay Stein
421 Murdoch Building
(412) 327-3587
mkstein@pitt.edu

I am a Professor of Learning Sciences and Policy at the School of Education (University of Pittsburgh) and a Senior Scientist at the Learning Research and Development Center. My research focuses on the study of mathematics teacher learning and classroom instruction, including how organizational and policy contexts shape instruction. I have been the lead or co-lead on ten federally funded research grants (IES or NSF) and have also been funded by a variety of private foundations including the McDonnell, Spencer and the MacArthur foundations. I have published widely in both research and practitioner venues. My book (with Margaret Smith) on *Five Practices for Orchestrating Classroom Discussion* is in its second printing and until just recently was the National Council of Teachers of Mathematics bestselling book.

The best way to contact me is via e-mail (mkstein@pitt.edu). I will usually be able to respond to your e-mail questions in 24 hours. If you need to “see” me, I can arrange a meeting via Zoom or in my office. Please e-mail me so that we can set up a date and time.

Course Overview

Recent reform efforts in mathematics (CCSSM) and science (NGSS) education set ambitious goals for every student. The success of these reform movements and the achievement of the desired outcomes for student learning rely on the implementation of “ambitious instruction” by teachers of mathematics and science. The aim of this course is to unpack the meaning of ambitious instruction in science and mathematics classrooms and to explore issues related to how teachers can learn to enact it.

During this course, students should have opportunities to:

- Articulate a **model or vision for teaching practice**. This should include defining the “components” of practice as well as important relationships among those components and/or contextual elements that impact teachers’ work.
- Describe, discuss, and compare **theories of teacher learning**.
- Draw from models of teaching practice and knowledge of how teachers learn to **design a professional development and/or teacher education intervention**. Justify design choices based upon models and theories read or discussed in class.
- **Propose ways to study** the efficacy of teacher learning contexts. Describe how such studies will contribute to what is currently understood about teacher learning.

This is a hybrid course. Face-to-face + Remote class meetings will be held at the University of Pittsburgh on four Saturdays (September 11, October 2, November 6, and December 4) between 1pm and 5pm; the rest of the class will take place asynchronously online using CANVAS. Each week will start on Monday morning and will end on Sunday (at midnight). It is important to follow the course schedule and complete the requirements in a timely manner so as to make the most of this course.

CHANGE AS OF AUGUST 24: The September 11 meeting will be all remote.

Course Policies

Attendance/Participation

Your active participation is necessary both for your own learning and that of others. Therefore, students are expected to attend all Saturday class sessions, arriving on time and staying until the session is over. Students should be prepared to participate in meaningful and respectful ways. This course meets as a whole class only four times throughout the term and missing one of those sessions constitutes a significant portion of the online interaction with the instructor and peers, and thus counts against points that you will receive for participation.

Although students are expected to attend all Saturday class sessions, working professionals sometimes find themselves in circumstances that cause them to miss these class meetings. Exceptions to the attendance policy may be made for a required work-related commitment, illness, or an emergency only. All other absences are not considered excused.

Academic Integrity

Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity (www.cfo.pitt.edu/policies/policy/02/02-03-02.html).

Cheating/plagiarism will not be tolerated. Students suspected of violating the University of Pittsburgh Policy on Academic Integrity, from the February 1974 Senate Committee on Tenure and Academic Freedom reported to the Senate Council, will be required to participate in the outlined procedural process as initiated by the instructor.

Classroom Recording

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion, and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.

Disability/Special Needs

If you require special circumstances to enable your participation in the course, please let me know as soon as possible. According to Pitt policy, if you have a disability that requires special testing accommodations or other classroom modifications, you need to notify both the instructor and the Disability Resources and Services no later than the 2nd week of the term. You may be asked to provide documentation of your disability to determine the appropriateness of accommodations. To notify Disability Resources and Services, call 648-7890 (Voice or TTD) to schedule an appointment. The Office is located in 216 William Pitt Union.

G-grades

Should any student anticipate being in a situation where he/she will be unable to complete the work required of this course, the student should make an appointment with his/her academic advisor and the course instructor as soon as possible. Under certain circumstances (and only with

approval from both the course instructor and academic advisor), the student may be granted a G-grade for the term. The student would then have an agreed-upon amount of time (not exceeding one academic year) to satisfactorily complete the work for the course. Upon receiving all work, the course instructor would evaluate the work and enter a permanent grade into the student's record.

Grievance Procedures

The purpose of grievance procedures is to ensure the rights and responsibilities of faculty and students in their relationships with each other. When a student taking a course in the Doctor of Education Program (EdD) believes that a faculty member has not met his or her obligations (as an instructor or in another capacity) as described in the Academic Integrity Guidelines, the student should follow the procedure described in the Guidelines by (1) first trying to resolve the matter with the faculty member directly; (2) then, if needed, attempting to resolve the matter through conversations with the EdD Program Director, Dr. Thomas Akiva tomakiva@pitt.edu; (3) if needed, next talking with the academic integrity officer of the school, Asst. Dean Shederick McClendon, samccclendon@pitt.edu; and (4) if needed, filing a written statement of charges with Asst. Dean McClendon.

Late Submission of Assignments

Unless otherwise noted, all assignments will be submitted to Canvas.

Late submissions should be cleared with the instructor before the due date. It is the student's responsibility to initiate requests for late submissions. Note that late assignments will have lowest priority for grading and feedback.

Re-submission of Assignments

You can re-submit an assignment until its due date. Once the due date passes, an assignment cannot be revised and/or submitted.

Required Materials

All materials are available in Canvas or will be provided during online class sessions or by instructor through email.

Sexual Harassment

The University of Pittsburgh is committed to the maintenance of a community free from all forms of sexual misconduct. Sexual misconduct violates University policy as well as state, federal, and local laws. It is neither permitted nor condoned. It is also a violation of the University of Pittsburgh's policy against sexual misconduct for any employee or student at the University of Pittsburgh to attempt in any way to retaliate against a person who makes a claim of sexual misconduct. Any individual who, after thorough investigation and an informal or formal hearing, is found to have violated the University's policy against sexual misconduct, will be subject to disciplinary action, including, but not limited to, reprimand, suspension, termination, or expulsion. Any disciplinary action taken will depend upon the severity of the offense. For more information, see University of Pittsburgh's Sexual Misconduct Policy:

<https://www.cfo.pitt.edu/policies/policy/07/07-06-04.html>

Course Requirements and Grading

The flow of the course has been designed to provide you with the opportunity to engage deeply with research and practice related to professional learning for mathematics and science teachers. We begin with a close examination of the work of teaching followed by readings that will help us think about how teachers can develop the knowledge, skills, and dispositions that are needed to engage in the work of teaching. Next, we turn to what is known about effective programs that support teacher learning, including both traditional professional development and newer interventions such as instructional coaching and video clubs. In the final segment of the course we take on issues related to professional learning as shaped by educational reform initiatives and federal and state policies.

The weeks run from Monday 8am through Sunday midnight.

Readings and Responses

This is a doctoral level course, so reading is a critical component of the course content. Reading materials can be found in course modules on Canvas. You are expected to complete assigned readings and upload responses to associated questions by Sunday midnight; for some weeks, you will need to turn them in no later than Wednesday in order to complete related assignments.

Each week begins with one or more readings followed by Reflection Questions that require a written, text-based response (approximately 150-200 words per question). These questions are designed to be answered independently in order to provide you with the time and space to formulate and collect your ideas with respect to the readings before participating in discussions or activities about them. My goal with this “private think time” is to prepare you to make better sense of the ideas introduced in readings and to help you to connect your understanding of the course readings to your individual perspectives.

Learning also happens in interaction with your peers. Therefore, some of the weeks will also involve requests to respond to postings from your peers.

Assignments

Assignment	Due Date	Percent of Final Grade
Participation	Continuous	20%
Reading Responses	Midnight Sunday (Midnight Wednesday for some)	20%
Assignment 1 Interview	October 2	20%
Assignment 2 Simulation and Paper	November 14	30%
Assignment 3	November 28	10%

Assignment 1 is a conversation with an expert in teacher education or teacher professional development, the purpose of which is to expand your understanding of this field and gain additional perspectives to those presented in this course.

Assignment 2 consists of the design and simulation of a professional education experience, the purpose of which is to provide you with the opportunity to “put into action” some of the core ideas that you’ve been reading about in the course.

Assignment 3 consists of reflections on your experiences in the course.

Grading

Grade	Percentage
A+	97-100
A	94-96
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D+	67-69
D	64-66
D-	60-63
F	< 60

Framing Questions

FRAMING QUESTION 1:

What is the work of teaching?

What knowledge, skills, experiences, dispositions, etc. are necessary to do the work of teaching?

FRAMING QUESTION 2:

How do teachers develop the knowledge, skills, dispositions, etc. (*capacities*) necessary for their practice?

FRAMING QUESTION 3:

How can we design contexts that support teachers' development of capacities for practice?

FRAMING QUESTION 4:

How do we measure teachers' learning related to teacher education, classroom, or professional development contexts?

FRAMING QUESTION 5:

Can we connect teacher learning to student achievement?

Course Schedule

Date	Readings and Activities
<p>Week 1: Aug. 30–Sept. 5</p> <p>FQ1</p>	<p>The Work of Teaching</p> <p>Ball, D.L., & Forzani, F.M. (2009). The work of teaching and the challenge for teacher education. <i>Journal of Teacher Education</i>, 60(5), 497–511.</p> <p>Windschitl, M., Thompson, J., Braaten, M., & Stroupe, D. (2012). Proposing a core set of instructional practices and tools for teachers of science. <i>Science Education</i>, 96(5), 878–903. Read pages 878–891.</p> <p>Assignment:</p> <ol style="list-style-type: none"> 1. How does conceptualizing the work of teaching as a set of core practices differ from how teaching is typically viewed? 2. What implications does viewing teaching from this perspective have for the design of professional learning experiences? <p><i>Answer these 2 questions drawing on both readings. Upload to CANVAS by midnight, Sunday, September 5.</i></p>
<p>Week 2: Sept. 6–Sept. 12</p> <p>FQ1</p>	<p>The work of teaching (cont.)</p> <p>Milner, H. Richard IV. (2010). What does teacher education have to do with teaching? Implications for diversity studies. <i>Journal of Teacher Education</i> 61(1-2) 118–131.</p> <p>Assignment:</p> <p>Milner acknowledges that instructional practices are important, but argues that teachers’ conceptions are important because they shape their practices, which consequently influence P-12 students’ opportunities to learn. Select one of Milner’s five conceptions and articulate how it shapes teachers’ instructional practice.</p> <p><i>Answer this question and upload to CANVAS by midnight, Sunday, Sept. 12.</i></p>
<p>Sept. 11 First synchronous meeting (all Remote)</p>	<p>Check In (30 minutes)</p> <p>Venn Diagram activity (60 minutes)</p> <p>Guest Lecturer: Dr. Crystal Menzies (60 minutes)</p> <p>Video: Mrs. Durst Car (60 minutes)</p> <p>Preview of upcoming readings (30 minutes)</p>
<p>Week 3: Sept. 13–19</p> <p>FQ1</p>	<p>The work of teaching: The importance of subject matter</p> <p>Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. <i>Educational Researcher</i>, 15 (2), 4–14.</p> <p>Ball, D.L., Thames, M.H., Phelps, G. (2008). Content knowledge for teaching: What makes it special? <i>Journal of Teacher Education</i>, 59(5), 389–407.</p> <p>Assignment:</p> <ol style="list-style-type: none"> 1. How did Shulman’s identification of the importance of subject matter knowledge help to define teaching as a profession?

	<p>2. What does content knowledge for teaching mean and how does it build on the promise of Shulman’s pedagogical content knowledge? (PCK)</p> <p><i>Drawing on both readings, answer each question and upload to CANVAS by midnight, Sunday, September 19.</i></p>
<p>Week 4: Sept. 20–26</p> <p>FQ2</p>	<p>Teacher Learning: How can teachers develop the knowledge, skills and dispositions to teach?</p> <p>Hammerness, K., Darling-Hammond, L., Bransford, J., Berliner, D., Cochran-Smith, M., McDonald, M., Ziechner, K. (2005). How teachers learn and develop. In L. Darling-Hammond & J. Bransford, (Eds.), <i>Preparing Teachers for a Changing World: What Teachers Should Learn and Be Able to Do</i> (pp. 358–389). San Francisco, CA: Jossey-Bass.</p> <p>Assignment: What is <i>adaptive expertise</i> and why do the authors call it the gold standard for becoming a professional?</p> <p>Putnam & Borko (2000). What do new views of knowledge and thinking have to say about research on teacher learning? <i>Educational Researcher</i>, 29(1), 4–15.</p> <p>Assignment: Most professional learning tends to facilitate teachers’ learning of general principles followed by helping them to apply this knowledge in the classroom. How is the situative view of learning different from this?</p> <p><i>Answer both questions and submit to CANVAS discussion page by midnight, Wednesday, September 22.</i></p> <p><i>Select a peer’s response to either of these two readings from which you learned something new about teacher learning. Briefly, state what you learned and how your peer’s response helped you to learn it. Upload your response in a reply to selected peer’s post by midnight, Sunday, September 26.</i></p>
<p>Week 5: Sept. 27–Oct. 3</p> <p>FQ4</p>	<p>How can we measure teachers’ learning related to teacher education, classroom practices or PD contexts?</p> <p>Boston, M., Bostic., Lesseig, K., & Sherman, M. (2015). A comparison of mathematics classroom observation protocols, <i>Mathematics Teacher Educator</i>, 3(2), 181–199.</p>

	<p><u>Assignment:</u> <i>Dr. Melissa Boston will be joining us live for the Saturday October 2 session. Prepare three questions that you would like to ask her about this article and upload to CANVAS.</i></p> <p>Desimone, N. L. (2009). Improving impact studies of teachers’ professional development: Toward better conceptualizations and measures. <i>Educational Researcher</i>, 38(3), 181–199.</p> <p><u>Assignment:</u> Desimone argues for a core conceptual framework for studying professional development. What would be the advantages and disadvantages of such a framework?</p> <p><i>Answer this question and upload to CANVAS by midnight, Sunday, October 3.</i></p>
<p>Oct. 2 Second synchronous session</p>	<p>Check In (30 minutes) Guest Lecturer: Melissa Boston (60 minutes) Students share information gained in their teacher educator interviews. Preview of upcoming readings (30 minutes)</p>
<p>Week 6: Oct. 4–10</p> <p>FQ2</p>	<p>Teacher Learning: How can teachers develop the knowledge, skills and dispositions to teach?</p> <p>Wilson, S. M., & Berne, J. (1999). Teacher learning and the acquisition of professional knowledge: An examination of research on contemporary professional development. In A. Iran-Nejad & P. D. Pearson (Eds.), <i>Review of Research in Education</i> (Vol. 24, pp. 173–209). Washington, DC: American Educational Research Association.</p> <p><u>Assignment:</u> Wilson and Berne review research on what and how teachers need to learn in order to stay abreast of new developments in research and the society at large. They are also attentive to the contexts in which teacher learning occurs. Select one idea about WHAT teachers should learn and then discuss the obstacles of designing and delivering PD that would assist that learning given current constraints in the system.</p> <p>Gay, G. (2002). Preparing for culturally responsive teaching. <i>Journal of Teacher Education</i>, 53(2)106–116</p> <p><u>Assignment:</u> Gay identifies 5 essential elements of culturally responsive teaching that pre-service teachers need to learn. Most of the projects cited in the Wilson and Berne article do not include any of those elements. Assuming that Gay is right in saying that teachers also do not encounter these elements in pre-</p>

	<p>service education, how might bridges be built from the 5 essential elements to in-service PD. Use one of the ‘successful’ projects in the Wilson & Berne paper (or a project that you are familiar with) to illustrate your point(s).</p> <p><i>Answer these questions and upload to CANVAS by midnight, Sunday, October 17.</i></p>
<p>Week 7: Oct. 11–17 [NOT REQUIRED] FQ2</p>	<p>Teacher Learning: Trajectory of teacher learning over time</p> <p>Feiman-Nemser (2001). From preparation to practice: Designing a continuum to strengthen and sustain teaching. <i>Teachers College Record</i>, 103(6), 1013–1055.</p> <p>Assignment: Select one of the phases of teacher education discussed by Feiman–Nemser with which you have experience, either as a designer / deliverer of the training or as a recipient of the training. Using some of the ideas in the article, discuss how well that experience met one or more of the central tasks for that phase, including any obstacles encountered.</p> <p><i>Answer this question and submit to CANVAS discussion page by midnight, Wednesday, October 13.</i></p> <p><i>Select a response by a peer who focused on a different phase of teacher education. Looking across the two phases, what are some similarities and differences in terms of challenges faced? Submit your response in a reply to selected peer’s post by midnight, Sunday, October 17.</i></p>
<p>Week 8: Oct. 18–24 FQ3</p>	<p>How can we design contexts that support teacher development?</p> <p>Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. <i>Educational Researcher</i>, 33(8), 3–15.</p> <p>Assignment: Borko proposes that professional development is comprised of 4 elements: the teacher, the facilitator, the professional development program, and the context. She goes on to identify 3 phases of research on professional development. Identify a professional development experience that you designed/delivered or one in which you engaged. Determine which of Borko’s phases it would fall into and why.</p> <p>Given that classification, what can be learned about teacher learning from this experience?</p> <p><i>Answer these questions and upload to CANVAS by midnight, Sunday October 24.</i></p> <p><i>You will be placed into small groups to hold a discussion about Borko, the highlights of which will be turned in to CANVAS. [NOT REQUIRED]</i></p> <p>(optional) Grossman, P., Compton, C., Igra, D., Ronfeldt, M., Shahan, E., & Williamson. P.W. (2009). Teaching practice: A cross –professional perspective. <i>Teachers College Record</i>, 111 (9), 2055–2100.</p>

<p>Week 9: Oct. 25–31</p> <p>FQ3</p>	<p>How can we design contexts that support teacher development?</p> <p><u>Use of Video:</u> Tekkumru-Kisa, M., & Stein, M. K. (2017). Designing, facilitating, and scaling-up video-based professional development: Supporting complex forms of teaching in science and mathematics. <i>International Journal of STEM Education</i>, 4(1), 1–9.</p> <p><u>Assignment:</u> This article is about designing contexts that support coach learning. Figure 1 shows possible layers of PD design. Use that figure (and Figure 1 in Borko if needed) to describe a PD or reform effort with which you are familiar.</p> <p><u>Coaching:</u> Gibbons, L. K., & Cobb, P. (2016). Content-focused coaching: Five key practices. <i>The Elementary School Journal</i>, 117(2), 237–260.</p> <p><u>Assignment:</u> Explain how instructional coaching is different from other forms of PD. To what extent, if any, do the 5 key coaching practices support the core work of teaching as outlined by Ball & Forzani? <i>Answer the 2 questions above and upload to CANVAS by midnight, Sunday, October 31.</i></p>
<p>Week 10: Nov. 1–7</p> <p>FQ3</p>	<p>How can we design contexts that support teacher development? (cont.)</p> <p>Burch, P., & Spillane, J. P. (2003). Elementary school leadership strategies and subject matter: Reforming mathematics and literacy instruction. <i>The Elementary School Journal</i>, 103(5), 519–535.</p> <p><u>Assignment:</u> In what ways does subject matter matter for school leaders? <i>Answer the question above and upload to CANVAS by midnight, Sunday, November 7.</i></p>
<p>Nov. 6 Third synchronous session</p>	<p>Simulations of Professional Development</p>
<p>Week 11: Nov. 8–14</p> <p>FQ5</p>	<p>Can we connect teacher learning to student achievement?</p> <p>Fennema, Carpenter, Franke, Levi, Jacobs, Empson (1996). A longitudinal study of learning to use children’s thinking in mathematics instruction. <i>Journal for Research in Mathematics Education</i>, 27(4), 403–434.</p> <p>It has been suggested that making an empirical connection between teacher learning in PD all the way to student learning is “a bridge too far.” A project that is repeatedly cited as having been able to do this is “Cognitively Guided</p>

	<p>Instruction (CGI),” discussed in this week’s reading. Although there are other positive outcomes of PD, rigorous research designs have not been able to “prove” a significant connection between teacher learning in PD and student achievement (see Garet, et al, [2016]. Focusing on Mathematical Knowledge: The Impact of Content-Intensive Teacher Professional Development. NCEE 2016-4010. National Center for Education Evaluation and Regional Assistance.).</p> <p>Wilson, S. (2013). Professional development for science teachers. <i>Science</i>, 340, 310–313.</p> <p>Assignment: This article was written for a special edition on Grand Challenges in science education in the journal <i>Science</i>, a highly respected international journal. The article has a section on rigorous research.</p> <p>Policymakers are very interested in student achievement gains. If you were on a board that was deliberating whether to provide more monies for research and for professional development in science and/or education, would you be inclined to invest in Science education research and practice? Why or why not?</p> <p><i>Answer this question and upload to CANVAS by midnight, Sunday, November 14.</i></p>
<p>Week 12: Nov. 15–21</p>	<p>How policy shapes our view of teaching and teacher education</p> <p>Milner, H. Richard IV. (2013). <i>Policy reforms and de-professionalization of teaching</i>. National Education Policy Center. Vanderbilt University.</p> <p>Assignment: Identify a recent or current educational reform policy. Analyze whether that policy lowers or raises the professional status of teaching. Does it (can it) perhaps do both?</p> <p><i>Answer this question and upload to CANVAS by midnight, Sunday, November 21.</i></p> <p>Smith, G. (Host). (2018, April 17). Teacher accountability [Audio podcast episode]. In <i>Education interview of the month</i>. National Education Policy Center. https://nepc.colorado.edu/publication/smith-cochran-smith</p>
<p>Week 13: Nov. 22–28</p>	<p>Thanksgiving Recess</p> <p>NO READINGS</p>

<p>Week 14: Nov. 29–Dec. 5</p>	<p>Improving teacher education</p> <p>McDonald, M., Kazemi, E., & Kavanagh, S.S. (2013). Core practices and pedagogies of teacher education: A call for a common language and collective activity. <i>Journal of Teacher Education</i>, 64(5), 378–386.</p> <p>Assignment: McDonald and co-authors make the case for a common framework and a common language for teacher education, both centered around the core practices of teaching. Given what you’ve learned in this course, do you think a common framework around the core practices is a viable way forward?</p> <p><i>Answer this question and upload to CANVAS by midnight, Sunday, December 5.</i></p> <p>(optional) Grossman, P., Hammerness, K., McDonald, M. (2009). Redefining teaching, re-imagining teacher education. <i>Teachers and Teaching: Theory and Practice</i>, 15(2), 273–289.</p>
<p>Week 15: Dec. 6–12</p>	<p>Work on Final Paper</p>
<p>Dec. 4 Final synchronous session</p>	<p>Simulations of Professional Development</p>