

Education 618B
Learning and Teaching in the Subject Area
Mathematics and Science

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COURSE DESCRIPTION

This 1.5-unit course aims to develop professional knowledge and a reflective stance toward teaching in secondary math and science classrooms. It focuses on understanding various ways in which adolescents might engage with content area learning, and it invites you to consider questions, stances, practices, and tensions involved in teaching these subjects. You will generate instructional units, lessons, and assessments, enact teaching both on campus and in school-based settings, examine teaching artifacts from local classrooms, and investigate the work of exemplary teachers.

The course aims to involve you in a continual juxtaposition of observing, planning, teaching, and reflective thinking. You will learn to implement best practices while also considering the pros and cons of what is considered “best.”

We will explore three tensions:

Tension 1: Teachers are implementers of curriculum and pedagogical problem-posers. Teachers face the dilemma of honoring children’s logic/thinking and teaching disciplinary knowledge.

Tension 2: Teachers are disciplinary experts (e.g. mathematicians, scientists) and human beings in a constant journey of learning. Teaching and learning occur within disciplinary communities in schools, across disciplines, and throughout the world in which we live.

Tension 3: Teachers are accountable to both public expectations and students’ diverse experiences and perspectives. Teachers navigate the space between schools as they are and schools as they might be.

COURSE OBJECTIVES

- You will learn to navigate the tension between content coverage and what's best for students by planning, teaching, and reflecting
- You will learn to analyze teaching and student thinking by analyzing curriculum and student work and writing reflections
- You will learn to create classroom environments that engage, challenge, and support students by writing lesson and unit plans
- You will learn to productively utilize the teacher inquiry cyclical process of questioning, planning, assessing, and reflecting by engaging in the process of planning and teaching

M.A.T. PROGRAM GOALS

The Masters of Arts in Teaching program at the University of Puget Sound prepares teachers who are reflective, collaborative and justice oriented, who

cultivate active critical reflection and questioning—to learn from practice, to improve practice, and to support teacher learning as a life-long process of growth

create productive and challenging learning environments—to support and assess student intellectual, social and emotional growth, active engagement, and sense of belonging.

interrogate their own biases and social location—to actively pursue culturally responsive practice and to contribute collaboratively to the ongoing work of equity

OUTLINE OF CONTENT AND SCHEDULE OF COURSEWORK

EXPLORING INQUIRY		
<ul style="list-style-type: none"> • How do teachers support authentic scientific and mathematical inquiry? • What do I want student to know and be able to do? Why? • What learning tasks will students experience? 		
Monday	Tuesday	Thursday
8/27 Introductions Structured Inquiry Course Organization	8/28 Syllabus Open Inquiry Analyzing Standards	8/30 Shared Reading Discussion All Secondary Candidates Reading: The Skillful Teacher Ch. 1 Introduction & Ch. 2 Teacher Beliefs (Saphier, Haley-Speca, Gower)
9/3 Labor Day Holiday	9/4 Full Day in School-based Placement	9/6 Full Day in School-based Placement
9/10 Reading Discussion: Inquiry Reading: What is Inquiry (Windschitl) Mathematical Tasks as a Framework for Reflection (Stein & Smith) Inquiry Anchor Experience --Generating a Model Inquiry Lesson Assignment	9/11 Inquiry Anchor Experience --Seeking Evidence	9/13 Inquiry Anchor Experience --Constructing an Argument
9/17 Inquiry Lesson Planning Workshop Reading: Defining Inquiry (Martin-Hansen) Developing Algebraic Habits of Mind (Driscoll) Assessment Assignment	9/18 Shared Reading Discussion All Secondary Candidates Reading: M.A.T. Masters Project Centering Race/Unlearning Racism --Science (Murdock) --Math (Chavez)	9/20 No Class
9/24 11:30-3:30 p.m. FOSS Science Lessons with K-8 Candidates Reading: Defining Inquiry (Martin-Hansen) FOSS Program Goals NGSS Practices & Crosscutting Concepts	9/25 No Class	9/27 Teaching Inquiry Lessons All Secondary Candidates Race and Pedagogy National Conference September 27-29, 2018
10/1 11:30-3:30 p.m. FOSS Science Lessons with K-8 Candidates Reading: A Discourse Primer for Science Teachers	10/2 Teaching Inquiry Lessons All Secondary Candidates	10/4 Teaching Inquiry Lessons All Secondary Candidates
10/8 11:30-3:30 p.m. FOSS Science Lessons with K-8 Candidates Reading: Scientific Thinking & Writing (Fulwiler)	10/9 Teaching Inquiry Lessons All Secondary Candidates	10/11 Debriefing Inquiry Lessons All Secondary Candidates Reading: Is Everyone Really Equal Ch. 2 Critical Thinking and Critical Theory & Ch. 3 Culture and Socialization

SUPPORTING PRODUCTIVE CLASSROOM TALK

- How do teachers elicit and monitor students' responses to deepen their understanding?
- How can I support students to construct evidence based explanations of everyday phenomenon (science) or share reasoning about conceptual understanding, procedural fluency and problem solving (math)?
- What counts as evidence of student learning?

Monday	Tuesday	Thursday
10/15 Fall Break Holiday	10/16 Fall Break Holiday	10/18 Reading Discussion: Assessment Reading: M.A.T. Masters Project (Tabbutt) Misconceptions (Campbell, Schwarz, Windschitl) Unit Plan Assignment
10/22 Academic Language Reading: Academic Language	10/23 Shared Reading Discussion All Secondary Candidates Reading: The Skillful Teacher Ch. 13 Personal Relationship Building. Read pages: 261-268, 272-274, 276-298, 305-306 (Saphier, Haley-Speca, & Gower)	10/25 No Class
10/29 Discourse Reading: Accessible Text (Tovani) Text Set Assignment	10/30 Discourse Reading: The Tools of Classroom Talk (Chapin, O'Conner, & Anderson)	11/1 Discourse
11/5 Discourse Reading: Group Work (Cohen)	11/6 Shared Reading Discussion All Secondary Candidates Reading: The Skillful Teacher Ch. 12 Expectations (Saphier, Haley-Speca, & Gower)	11/8 Unit Planning: Big Ideas Reading: Beyond Being Told Not to Tell (Chazan & Ball)
11/12 Unit Planning: Big Ideas	11/13 Shared Reading Discussion All Secondary Candidates Reading: The Skillful Teacher Ch. 14 Classroom Climate (Saphier, Haley-Speca, & Gower)	11/15 Microteaching Unit Planning: Assessment
11/19 Unit Planning: Assessment	11/20 Unit Planning All Secondary Candidates	11/22 Thanksgiving Holiday
11/26 Microteaching Unit Planning: Assessment	11/27 Microteaching Unit Planning: Language Demands	11/29 Unit Planning All Secondary Candidates
12/3 Microteaching Unit Planning	12/4 Unit Planning All Secondary Candidates	
12/10 Unit Plan Due by 12:00 noon		

STUDENT REQUIREMENTS AND EVALUATION

Because the School of Education is a graduate professional school and you are being prepared for a professional role, assignments are not given letter grades. We draw on adult learning theory, emphasizing feedback throughout the term and using professional judgment to evaluate the ways you engage in the activities of the profession. Consistency, purposefulness, and intentionality in your efforts in this seminar are important for your professional growth. Your final grade will be determined through the following process: You will complete a self-evaluation focusing on a range of goals for this course and giving yourself a course grade. The professor will review student performance and self-evaluation to determine the grade in the course.

The assessments described below are designed to make public the practices of planning, instructing, assessing, and reflecting. Assignment expectations and deadlines will be distributed and discussed in class. Assignments must be submitted at the beginning of class on the date they are due. You will make an appointment with the professor in the event that you must submit late work.

Inquiry Lesson and Reflection—You and your school-based experience partner will develop an inquiry lesson unit related to a unit of study observed in your school placement classroom. You will teach your lesson to colleagues, and write a reflection.

Assessing Student Learning—You will analyze a class set of student responses to one assessment in your school-based placement. You will look for patterns in student learning and to consider how to modify assessments to best support student learning.

Text Set—Create a text set of three accessible readings related to a unit of study observed in your school placement classroom. In one page describe why you think the texts are accessible and how they might deepen student learning. Identify or create the specific tools/supports that you might use for one of the texts.

High School Unit of Instruction—You will develop a unit framework, assessments, and lesson segment that is related to a unit of study observed in your school placement classroom.

Reflective Writing—You will write reflective commentaries to help you make sense of and draw connections between course experiences, assigned readings, your experiences in your school-based placements and your own educational experiences.

Participation, Attendance, and Punctuality—You will take multiple roles in class by engaging in activities such as: completing in-class writing assignments, participating in discussions, sharing insights from school-based experiences, teaching lessons, evaluating the teaching of others, and participating as a positive and productive community member. Interpersonal skills (e.g., actively working to build relationships with others, considering other points of view, and considering the time and needs of others), problem solving (e.g., considering multiple perspectives, responding positively to feedback, and asking questions), and work ethic (e.g., consistent attendance, completing work by deadlines, and flexibility) are critical to your development as a professional.

COURSE READINGS

Course Readings

Readings will be posted to Canvas.

Course materials are subject to the copyright law of the United States (Title 17 U.S. Code). They are for educational purposes only and limited to students enrolled in the course. Further reproduction or distribution is prohibited.

Professional Journals

The following professional journals may be helpful to you as you develop lessons, units, classroom practices, and rich classroom environments.

Mathematics	Science
<i>The Mathematics Teacher</i>	<i>The Science Teacher</i>
<i>Mathematics: Teaching in Middle School</i>	<i>Science Scope</i>
	<i>The American Biology Teacher</i>
	<i>Journal of Chemical Education</i>

Washington State Standards (will be distributed in class)

Common Core State Standards for Mathematics, 6-12.

http://www.k12.wa.us/CoreStandards/Mathematics/pubdocs/CCSSI_MathStandards.pdf

Next Generation Science Standards (NGSS).

Disciplinary Core Ideas: <http://www.nextgenscience.org/sites/ngss/files/NGSS%20DCI%20Combined%2011.6.13.pdf>

Cross Cutting Concepts:

<http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf>

Science and Engineering Practices:

<http://www.nextgenscience.org/sites/ngss/files/Appendix%20F%20-%20Science%20and%20Engineering%20Practices%20in%20the%20NGSS%20-%20FINAL%20060513.pdf>

Common Core Standards for Literacy in History/Social Studies, Science, and Technical Subjects:

http://www.k12.wa.us/CoreStandards/ELAstandards/pubdocs/CCSSI_ELA_Standards.pdf#59

Internet Resources

Organization	Web Site
Math Resources	
National Council of Teachers of Mathematics	www.nctm.org
Washington State Mathematics Council	www.wsmc.net
Interactive Mathematics Project	www.mathimp.org
Math Forum	www.mathforum.org
Virtual Manipulatives	http://nlvm.usu.edu/
Science Resources	
National Science Teachers Association	www.nsta.org
Washington Science Teachers Association	www.wsta.net
Facing the Future	http://www.facingthefuture.org/
American Chemical Society	www.chemistry.org
National Association of Biology Teachers	www.nabt.org
National Association of Geoscience Teachers	www.nagt.org
North American Association for Environmental Education	www.naaee.net/
Environmental Education Association of Washington	www.e3washington.org
Washington State Standards and Assessments	
Washington State Learning Standards	www.k12.wa.us/CurriculumInstruct/learningstandards.aspx
Math: Smarter Balanced Assessment	www.k12.wa.us/Mathematics/Assessment.aspx
Washington Comprehensive Assessment of Science (WCAS)	www.k12.wa.us/Science/Assessments.aspx

Professional Organizations

Professional organizations are one way to get involved with a network of math and science educators and to have access to ongoing professional development opportunities. Two organizations you might consider joining are listed below:

National Council of Teachers of Mathematics (NCTM), \$49/year (for Student Membership) entitles you to an online subscription to *The Mathematics Teacher* and three other journals. Apply online at <http://www.nctm.org/Membership/Membership-Options-for-Individuals/>

National Science Teachers Association (NSTA), \$39/year (for Student Membership) entitles you to a monthly subscription to *Science Scope* or *The Science Teacher*. Apply online at <http://www.nsta.org/membership/individual.aspx>

Upcoming Conferences

Conferences are ideal for getting involved with other educators, obtaining curriculum materials, and extending your knowledge of teaching and learning. MAT candidates will attend the Teachers and Students Unlearning Racism strand of the Race and Pedagogy 2018 National Conference. Three other conferences you might consider attending are listed below:

- **Race and Pedagogy 2018 National Conference**
Radically Re-Imagining the Project of Justice: Narratives of Rupture, Resilience, and Liberation
September 27-29, 2018
University of Puget Sound, Tacoma, WA
The mission of the Race and Pedagogy Institute is to educate students and teachers at all levels to think critically about race, to cultivate terms and practices for societal transformation, and to act to eliminate racism.
Register at <https://www.pugetsound.edu/academics/academic-resources/race-pedagogy-institute/2018-race-pedagogy-national-conference/>
- **Washington Science Teachers Association Fall Annual Meeting**
October 19-20, 2018
Bellingham, WA
See program and register at <https://wsta.wildapricot.org/page-1863512>
- **57th Annual Northwest Mathematics Conference**
October 18-20, 2018
Whistler, BC
See program and register at <http://bcamt.ca/nw2018/>
- **National Science Teacher's Association Area Conference**
October 11-13, 2018
Reno, CA
See program and register at <http://www.nsta.org/conferences/>

WASHINGTON TEACHER STANDARDS-BASED BENCHMARKS

The Washington Teacher Standards-based benchmarks include three standards (1) effective teaching, 2) professional development, 3) teaching as a profession. Each standard is comprised of multiple criteria; for each criteria there are three levels of the career continuum (residency, professional, and career). These competencies focus learning and teaching experiences throughout the M.A.T. program. Criteria in bold below are the criteria for residency certification.

Standard 1 Effective Teaching

Criteria 1 — Using multiple instructional strategies to address individual student needs. Using multiple instructional strategies, including the principles of second language acquisition, to address student academic language ability levels and cultural and linguistic backgrounds.

Criteria 2 — Integrating subjects across content areas. Applying principles of differentiated instruction, including theories of language acquisition, stages of language, and academic language development, in the integration of subject matter across the content areas of reading, mathematical, scientific, and aesthetic reasoning.

Criteria 3 — Using a variety of assessments to monitor and improve instruction. Using standards-based assessment that is systematically analyzed using multiple formative, summative, and self-assessment strategies to monitor and improve instruction.

Criteria 4 — Creating a safe, productive learning environment. Implementing classroom/school centered instruction, including sheltered instruction that is connected to communities within the classroom and the school, and includes knowledge and skills for working with others.

Criteria 5 — Planning curricula for diverse student needs. Planning and/or adapting standards-based curricula that are personalized to the diverse needs of each student. Aligning instruction to the learning standards and outcomes so all students know the learning targets and their progress toward meeting them.

Criteria 6 — Ensuring cultural sensitivity/competence. Planning and/or adapting learner centered curricula that engage students in a variety of culturally responsive, developmentally, and age appropriate strategies.

Criteria 7 — Integrating technology. Planning and/or adapting curricula that are standards driven so students develop understanding and problem-solving expertise in the content area(s) using reading, written and oral communication, and technology. Using technology that is effectively integrated to create technologically proficient learners.

Criteria 8 — Involving and collaborating with families, neighborhoods and communities. Preparing students to be responsible citizens for an environmentally sustainable, globally interconnected, and diverse society. Informing, involving, and collaborating with families/neighborhoods and communities in each student's educational process, including using information about student cultural identity, achievement and performance.

Standard 2 Professional Development

Criteria 1 — Utilizing feedback and reflection to improve teaching practice. Developing reflective, collaborative, professional growth-centered practices through regularly evaluating the effects of his/her teaching through feedback and reflection.

Criteria 2 — Using standards for self-assessment, plan and implement professional growth

Criteria 3 — Seeking new learning to remain current in field

Standard 3 Teaching as a Profession

Criteria 1 — Advocating for diverse needs of each student

Criteria 2 — Collaborating in and contributing to school improvement. Participating collaboratively and professionally in school activities and using appropriate and respectful verbal and written communication.

Criteria 3 — Serving in formal and informal leadership roles

Criteria 4 — Providing meaningful feedback to colleagues

UNIVERSITY OF PUGET SOUND STATEMENTS AND POLICIES

UNIVERSITY MISSION STATEMENT

As teachers we must think carefully and intentionally about the enduring understandings that will focus learning experiences. The University of Puget Sound has a commitment to enduring understandings for student learning which are reflected in the university statement. “The mission of the university is to develop in its students capacities for critical analysis, aesthetic appreciation, sound judgment, and apt expression that will sustain a lifetime of intellectual curiosity, active inquiry, and reasoned independence. A Puget Sound education, both academic and co-curricular, encourages a rich knowledge of self and others; an appreciation of commonality and difference; the full, open, and civil discussion of ideas; thoughtful moral discourse; and the integration of learning, preparing the university's graduates to meet the highest tests of democratic citizenship. Such an education seeks to liberate each person's fullest intellectual and human potential to assist in the unfolding of creative and useful lives.”

ACADEMIC INTEGRITY

Teachers in public schools teach not only subject matter content, but also ethics and dispositions. The University of Puget Sound is a community of faculty, students, and staff engaged in the exchange of ideas contributing to intellectual growth and development. Essential to the mission of the academic community is a shared commitment to scholarly values, intellectual integrity, and respect for the ideas and work of others. At Puget Sound, we share an assumption of academic integrity at all levels. Please review the University's Academic Integrity Policy at <http://www.pugetsound.edu/student-life/student-resources/student-handbook/academic-handbook/academic-integrity/>.

UNIVERSITY DIVERSITY STATEMENT

As teachers we must critically examine our own educational and life biographies and work to understand students who have had experiences that are both similar and very different from our own. The university shares this commitment to building a learning community based on a respect and appreciation for all persons.

We Acknowledge

- the richness of commonalities and differences we share as a university community.
- the intrinsic worth of all who work and study here.
- that education is enhanced by investigation of and reflection upon multiple perspectives.

We Aspire

- to create respect for and appreciation of all persons as a key characteristic of our campus community.
- to increase the diversity of all parts of our University community through commitment to diversity in our recruitment and retention efforts.
- to foster a spirit of openness to active engagement among all members of our campus community.

We Act

- to achieve an environment that welcomes and supports diversity.
- to ensure full educational opportunity for all who teach and learn here.
- to prepare effectively citizen-leaders for a pluralistic world.

ACCESSIBILITY AND ACCOMODATIONS

As teachers we must personalize instruction to addresses students' learning strengths and needs. If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Peggy Perno, Director of the Office of Accessibility and Accommodations, 105 Howarth, 253.879.3395. She will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

STUDENT BEREAVEMENT POLICY

As teachers we must be responsive to students' expressed need for bereavement. Upon approval from the Dean of Students' Office, students who experience a death in the family, including parent, grandparent, sibling, or persons living in the same household, are allowed three consecutive weekdays of excused absences, as negotiated with the Dean of Students'. For more information, please see the Academic Handbook.

CAMPUS EMERGENCY RESPONSE GUIDANCE

Teachers in public school settings have many responsibilities, including ensuring student safety. The University of Puget Sound, like public schools, takes this responsibility very seriously. Please review university emergency preparedness and response procedures posted at www.pugetsound.edu/emergency. Familiarize yourself with hall exit doors and the designated gathering area for your class buildings. For this class our designated gathering area is in Jones Circle at the fountain. In the event of an emergency remain calm, be prepared to act quickly, and listen for instructions from campus personnel.

Please review university emergency preparedness, response procedures and a training video posted at www.pugetsound.edu/emergency/. There is a link on the university home page. Familiarize yourself with hall exit doors and the designated gathering area for your class and laboratory buildings.

If building evacuation becomes necessary (e.g. earthquake), meet your instructor at the designated gathering area so she/he can account for your presence. Then wait for further instructions. Do not return to the building or classroom until advised by a university emergency response representative.

If confronted by an act of violence, be prepared to make quick decisions to protect your safety. Flee the area by running away from the source of danger if you can safely do so. If this is not possible, shelter in place by securing classroom or lab doors and windows, closing blinds, and turning off room lights. Lie on the floor out of sight and away from windows and doors. Place cell phones or pagers on vibrate so that you can receive messages quietly. Wait for further instructions.