"Education either functions as an instrument which is used to facilitate integration of the younger generation into the logic of the present system and bring about conformity or it becomes the practice of freedom, the means by which men and women deal critically and creatively with reality and discover how to participate in the transformation of their world." – Paulo Freire, Pedagogy of the Oppressed

Course Title: UNIV 1110: The Theory and Practice of Problem Solving
Instructor Name: Dr. Christina Smith; email christina_smith2@brown.edu
Office Hours and Location: Wednesday 10:00-12:00, 707 Sciences Library

Classroom Location: Science Library 720
Meeting Times: Tuesday/Thursday 10:30-11:50
Requirements: Instructor approval is required for this course. You will need to provide a signed form from a faculty member you will be working with as a UTA for Spring 2018. Students will be notified by January 26, 2018 about whether they will be able to enroll in the course.

The following resource(s) will be provided free of cost to students:

- McGuire, S. Y. (2015). *Teach students how to learn: Strategies you can incorporate into any course to improve student metacognition, study skills, and motivation*. Stylus Publishing, LLC.
- Merriam, S. B., & Bierema, L. L. (2013). *Adult learning: Linking theory and practice*. John Wiley & Sons.

Course Description

This course is designed to create more effective problem solvers through understanding what effective problem solving entails and how to facilitate others' learning of problem solving. This course will address the fundamentals of learning theory, problem solving, and evidence-based instructional practices for STEM undergraduate teaching assistants. Course readings, assignments, and activities will introduce students to: metacognitive practices that improve student learning; components of effective problem solving; how to engage a diverse group of students; and how to reflect, evaluate, and improve current teaching practices. Students will gain skills that will aid them in their own learning, promote learning in others, improve communication and problem solving capabilities, and prepare them to engage more deeply in diverse learning spaces. This course is S/NC and a designated WRIT course.

Course Learning Objectives

1. Describe learning theory frameworks and relate them to a diverse student population and Brown University STEM learning environments
2. Identify key components to problem solving within your discipline and how problem construction is influenced by environment and culture
3. Develop reflective learning and evidence-based instructional practices that will help you be an effective facilitator of problem solving
4. Support diverse students in their efforts to learn by creating inclusive and respectful learning environments
5. Practice giving, receiving, and incorporating constructive feedback regarding instructional practices and writing through written assignments and peer observations

Teaching Statement

I believe teaching and learning occur through social interactions and that everyone has the right to learn. However, I know that there are social, physical, and financial barriers that may be placed in the way of pursuing education. I recognize that how we view the world, science, engineering, life, is subjective and constructed within a social realm that privileges certain perspectives more than others. I hope to teach you in such a way that you will be able to transfer what you learn in one context to other aspects of your education, as well as your other social, racial/ethnic, political, or spiritual identities. I want to provide you with the opportunity to grapple with and recognize these different perspectives and how they relate to you as a person situated within a global community.

I believe learning to be malleable; people have limitless potential and the ability to accomplish what they wish if they should put forth the effort with the right resources. I believe that practice and constant reflection and assessment will help you learn the content and prepare you to be an engaged lifelong learner. The activities used in this course are all feedback mechanisms to indicate to you where you need to improve and what concepts you might need to focus on. I will learn from you as much as you learn from me. I want you to take responsibility for your learning and know that you have the power to choose what you will get out of this course.

Communication

Please post all general course-related questions in the General Discussion Forum in Canvas so that the whole class may benefit from our conversation. Please email me for matters of a personal nature. I will do my best to respond in a timely manner. I believe productive feedback for/from both the student and the instructor is critical to ensure an equitable learning environment that will help you succeed academically, professionally, and personally.

Work Expectations

Over 14 weeks, students will spend 3 hours per week in class (42 hours total). Required reading for the seminar meetings is expected to take up approximately 5 hours per week (70 hours total). As detailed below, assignments are estimated at 68 hours.

Independent Assignments

Teaching statements	5 hours
Reflections	8 hours
Problem solving storytelling	5 hours
Problem solving think alouds	15 hours
Teaching observation	4 hours

Group Assignments

Concept maps	8 hours
Peer teaching observations	5 hours
Final group project	18 hours

Evaluation

15% Participation in class
15% Written assignments (reflections, teaching statements, concept maps)
5% Storytelling
25% PS think alouds
15% Observations
25% Final group project(s)

Learning Resources

- **Canvas or Brown Blog:** This course will be delivered via Canvas or Brown Blog where you will interact with your classmates and with me. Within the course site you will access the learning materials, such as the syllabus, class discussions, reading assignments, and descriptions of projects. This is a great tool for me to provide you with feedback as well as for you to talk with our community of learners.
- **English Language Learning Services:** Brown provides English support for international and multilingual students. If English is not your first language, email ellwriting@brown.edu edu to ask a question or make an appointment with an ELL specialist.
- **Writing Center:** To request an appointment: https://www.brown.edu/academics/college/support/writing-center/appointments/appointments/appointment-policies
- **Deans:** Students in need of short-term academic advice or support can contact one of the dean in the Dean of the College office.
- **CAPs:** Students seeking psychological support services should contact counseling and psychological services (CAPs)

Accessibility and Accommodations Statement

Brown University is committed to full inclusion of all students. Please inform me early in the term if you have a disability or other conditions that might require accommodations or modification of any of these course procedures. You may speak with me after class or during office hours. For more information, please contact ***Student and Employee Accessibility Services*** *at 401-863-9588 or SEAS@brown.edu. Students in need of short-term academic advice or support can contact one of the deans in the Dean of the College office.*

Diversity Statement

A key component to this course, and all learning environments, is recognizing that we all come from different backgrounds and lived experiences. I believe that the variety of voices and perspectives will add richness and depth to the conversations we will have in class and is instrumental when approaching and designing solutions to problems. I have made an effort to include in the readings and assignments components of such a variety in the education and STEM literature, but I do recognize that there is room for my own improvement.

Brief Assignment/Activity Descriptions

Teaching statement (2)
You will write a 1-2 page (500-1000 words) teaching statement or philosophy at the beginning and end of the term, along with a **reflection** (250-500 words) on how it has changed or stayed the same. This assignment is designed to have you reflect on why and how you interact with students in the classroom in order to: ground your teaching practices, identify areas where you would like to build on your teaching skills, provide you with a discussion point for how you developed interpersonal skills, and be an early draft for a teaching portfolio should you choose to start a career in teaching. Twice during the term you will receive peer and instructor feedback that you will be expected to incorporate into subsequent drafts of your statement.

Written reflections (2-4)
After certain readings, discussions, or activities, you will write a 1-page (250-500 words) reflection that synthesizes the material we are discussing with your personal learning or teaching experiences. These are meant to act as a metacognitive moment and to provide you with the opportunity to add your perspective to the conversation. It will also provide me with information on how to tailor content to your current practices, concerns, or triumphs.

Concept maps (4)
You will work in groups (2-3 students) to submit a concept map of the concepts covered at the end of a unit. A concept map is a visual representation of how you and your group make sense of the material and how it relates to your teaching. The concept map will grow as we progress through the course and a final version will be presented to the rest of the class.

Storytelling/Narrative (1)
You will pick one problem from your discipline that you would like to tell through a narrative form. This activity is designed to have you think critically and creatively about a problem by communicating it in an alternative way (e.g. podcast, interpretive dance, song, allegory, etc.).

Self-study problem solving think aloud (2)
This course is centered around understanding and improving problem solving within yourself and students. Twice during the term, you will conduct a think-aloud and create a model of your thought process as you work through 1) a problem that is familiar to you, and 2) a new problem. For a familiar problem, I suggest using one that relates to your current teaching assignment. For a new problem, feel free to use one from your current coursework. After creating a model for each of these problems you will write a 1-page (250-500 words) **reflection** and create a short (2-5 minutes) presentation of your model.

Teaching observations (3)
During the course of the term you will observe one instructor outside of your discipline and write a 1-page (250-500 words) **reflection** based on the concepts we have covered in the course. We will discuss how to conduct observations in class.

You will also video record and "observe" your own teaching (at least 1 hour) with a partner. Prior to an observation, determine three objectives and three observables you want to focus on. After evaluating and providing feedback on the teaching, you will then choose 2-3 minutes from the video to present to the class to discuss. Based on when you complete your own observation, we will work together to determine which day you will present.

In-Class Readings (3-6)
Three times during the term, you will be responsible for reading and being prepared to discuss articles or case studies that you have found on particular subjects. We will discuss these in class as part of a larger discussion.

Group Project(s)
Based on your work in this course, we will design a final project together that will serve as a capstone of your experience in this course. Along with a culmination of your learning, this project will be a resource for the Problem-Solving Program and/or instructors in your concentration. This project will evolve as the course progresses and will culminate in a final presentation.

Course Policies

Class participation and discussions
You will be expected to attend and come prepared (e.g. finished the readings, completed the assignments) to all class meetings. I expect that you come with one question and one comment about the reading. Solving problems requires creating a community with diverse perspectives to critically think about, communicate, and provide solutions. This can only be done if everyone attends and is prepared to engage in conversations with peers respectfully. More than three missed class sessions will be considered excessive, which can result in an NC grade.

Missed assignments
Late assignments will not be accepted; however, I recognize that the term can get hectic. You will have two, 48-hour grace periods to use on any two assignments throughout the course, no questions asked. Please let me know at the time the assignment is due that you will be using a grace period. This will not be applicable to presentations in class or the final group project(s).

Academic Honesty
Much of the assigned work requires you to draw from your own personal experiences while integrating concepts discussed in the course. As such, it is important that the work you present has been produced independently and with proper citation. Should some form of academic misconduct occur there are a variety of penalties. For more information please review the Academic Code.

UNIV 1110: The Theory and Practice of Problem Solving

Week	Date	Topic*	Reading	# of pages	Assignment
Introduction					
1	1/25	Problem Solving Introduction	Jonassen, D. H. (2000). Toward a design theory of problem solving. *Educational technology research and development*, *48*(4), 63-85.	23	Reflection DUE 1/28
2	1/30	Epistemology	Hofer, B. K., & Pintrich, P. R. (1997). The development of epistemological theories: Beliefs about knowledge and knowing and their relation to learning. *Review of educational research*, *67*(1), 88-110.	22	
2	2/1	Traditional Learning Theories Qualities of an Effective Teacher Teaching Observations	Chapter 2: *Traditional learning theories* in Merriam and Bierema (2014), 24-41. Stronge, J. H. (2007). *Qualities of effective teachers*. ASCD. (discuss in class)	17	Teaching statement DUE 2/4
Characteristics, Attitudes, and Environment Necessary for Problem Solving					
3	2/6	Mindset, Motivation, Emotions, and Learning	Chapters 6-7 in McGuire, S. Y. (2015), 60-79.	19	
3	2/8	Facilitating Group Dynamics: Biases and Stereotype Threat	Horn, I. (2004). Why do students drop advanced mathematics?. *Educational Leadership*, *62*, 61-65. Horn, I. S. (2012). *Strength in numbers: Collaborative learning in secondary mathematics*. National Council of Teachers of Mathematics, 19-33.	18	Concept map DUE 2/11
Skills Necessary for Effective Problem Solving					
4	2/13	Critical Thinking	Chapter 11: *Critical thinking and critical perspectives* in Merriam and Bierema (2014), 212-237.	25	

4	2/15	Active Listening and Questioning Strategies	Blosser, P. E. (1991). *How to ask the right questions*. NSTA Press. White, D. Y. (2003). Promoting productive mathematical classroom discourse with diverse students. *The Journal of Mathematical Behavior*, *22*(1), 37-53.	24	Reflection DUE 2/18
5	2/20	NO CLASS			
5	2/22	Experiential and Situated Learning	Chapter 6: *Experiences and learning* in Merriam and Bierema (2014), 104-126.	22	Instructor observation and reflection DUE 2/25
6	2/27	Mental Models and Self Explanations	Redish, E. F. (1994). Implications of cognitive studies for teaching physics. *American Journal of Physics*, *62*(9), 796-803.	7	
6	3/1	Teamwork and Metacognition	Frey, N., Fisher, D., & Everlove, S. (2009). "Defining productive group work" in *Productive group work: How to engage students, build teamwork, and promote understanding*. ASCD, 13-22. Available online through the Brown library Tanner, K. D. (2012). Promoting student metacognition. *CBE-Life Sciences Education*, *11*(2), 113-120.	16	Concept map 2 DUE 3/4
Problem Definition					
7	3/6	Problem Solving Definition	Pretz, J. E., Naples, A. J., & Sternberg, R. J. (2003). Recognizing, defining, and representing problems. *The psychology of problem solving*, *30*(3).	25	
7	3/8	Discipline Based Problem Solving	Read and bring 1-2 article(s) regarding problem solving in your discipline		
8	3/13	Culture and Context	Chapter 12: *Culture and context, theory and practice in adult learning* in Merriam and Bierema (2014), 238-258.	20	

8	3/15	Understanding by Design and Bloom's Taxonomy	UBD Videos, Part 1 and 2 https://cft.vanderbilt.edu/guides-sub-pages/understanding-by-design/ Crowe, A., Dirks, C., & Wenderoth, M. P. (2008). Biology in bloom: implementing Bloom's taxonomy to enhance student learning in biology. *CBE-Life Sciences Education*, *7*(4), 368-381.	14	Self-study think alouds and reflection DUE 3/18
Generating Ideas and Solutions					
9	3/20	Body and Spirit in Learning	Chapter 7: *Body and spirit in learning* in Merriam and Bierema (2014), 127-145. Mindfulness guest facilitator	18	
9	3/22	Student Conceptions	Chapter 12: *Teaching unprepared students* in McGuire, S. Y. (2015), 156-162. Bring in an article that describes student (mis)conceptions in your discipline	6	Reflection DUE 3/25
10	3/27	NO CLASS	Complete individual teaching observation		
10	3/29	NO CLASS			
11	4/3	Promoting Creativity	Chavez, A. F., & Longerbeam, S. D. (2016). "Culture in college teaching" in *Teaching Across Cultural Strengths: A Guide to Balancing Integrated and Individuated Cultural Frameworks in College Teaching*. Stylus Publishing, LLC, 61-96.	35	
11	4/5	Working with English Language Learners	Guest facilitators, reading TBD Escape room TBD		Storytelling DUE 4/8
Making Decisions, Implementation and Evaluation of Solutions					
12	4/10	Goal Setting and Planning Metacognition and Bloom's Taxonomy **Observation Presentations**	Chapters 3-4 in McGuire, S. Y. (2015),15-42.	27	

12	4/12	Discourse in the Classroom **Observations Presentations**	Gallagher-Geurtsen, T. (2007). Linguistic privilege: Why educators should be concerned. *Multicultural Perspectives*, *9*(1), 40-44. von Duyke, K., & Matusov, E. (2015). Flowery math: a case for heterodiscoursia in mathematics problems solving in recognition of students' authorial agency. *Pedagogies: An International Journal*, *11*(1), 1-21.	24	Concept map 3 DUE 4/15
13	4/17	Argumentation	Jimenez-Aleixandre, M. P., Rodriguez, A. B., & Duschl, R. A. (2000). "Doing the lesson" or" doing science": Argument in high school genetics. *Science Education*, *84*(6), 757-792.	35	
13	4/19	Ethics	Bring in 2 articles or case studies of ethics violations in your discipline		
14	4/24	Assessment and Evaluation	Moss, C., & Brookhart, S. (2009). The lay of the land: Essential elements of the formative assessment process. *Assessment in every classroom: A guide for instructional leaders. Alexandria, VA: ASCD,* 5-23. Available through the Brown library	18	
14	4/26	Scientific Practices	McComas, W. F., & Kampourakis, K. (2015). Using the history of Biology, Chemistry, Geology, and Physics to illustrate general aspects of Nature of Science. *Review of Science, Mathematics and ICT education*, *9*(1), 47-76.	30	Teaching statement and reflection DUE 4/29
15	5/1		Work on group projects and final concept map		
15	5/3		Work on group projects and final concept map		Final concept map DUE 5/6
16	TBD	**FINAL PRESENTATIONS**			

*This is a tentative schedule. Dates and topics may change.