

TCH LRN 531: Frameworks for Research in Mathematics and Science Education

3 credits

W: 17:45 – 20:30

Locations:

Pullman: SPRK 335; Spokane: SAC 205

Vancouver: VMMC 102Q; Tri-Cities: TFLO 224

Office Hours: Monday 10am – 12pm or by appointment

Professor: Andy Cavagnetto, PhD

Office: Cleveland 236B

andy.cavagnetto@wsu.edu

(509) 335-6391

Course Description:

Research in educational contexts tends to explore complex phenomena –often driven by causes at multiple levels of a given system. As such, these phenomena can often not be disentangled cleanly and require examining the phenomena from multiple perspectives to build strong evidentiary support for and/or rule out various explanations. Because of this, educational researchers utilize a wide variety of frameworks to guide their research. Each of these frameworks is guided by different metaphysical commitments and assumptions that influence how one conducts a study and the inferences drawn from a study. As such, it is important to understand the various research frameworks used in math/science education and how they interact. Thus, the purpose of this course is to explore commonly used frameworks and consider questions such as *What are the advantages of various frameworks (that is, what do they afford)? What are the limitations of different frameworks? Where is the overlap among various frameworks?* and *What is the empirical evidence for various frameworks?* These questions will guide our study this semester. We will then analyze data from learning environments using a multitude of frameworks.

Textbooks and Course Materials:

- Readings will be posted on course Canvas site.
- Strongly Recommended: *The Little Book: Conceptual Elements of Research* by Marino C. Alvarez and D. Bob Gowin. We will use this book as a reference particularly in the later stages of the course as we work to conduct a short study with given data. Separate from that it is a helpful resource for conceptualizing research in education.

Student Learning Outcomes:

Learning Outcome	Assessment
Understand the key characteristics of broad research frameworks used in Math/Science Education Research and how they relate to one another.	Participation in weekly discussions. Concept map of broad research frameworks.
Demonstrate an ability to critically read and interrogate primary educational research literature.	Participation in weekly discussions. Student-led discussion of finer-grained research framework.
Demonstrate an ability to link research framework, research question, analysis, and interpretation.	Participation in weekly discussions. Final presentation of Research findings.

Assignments: (Specific details, including grading, for each assignment will be discussed in class well before the due date as we move through the semester)

1) Participation in weekly discussions –this will be assessed weekly (30%) –This is a seminar style course so participation in these discussion is central to your learning and development as a scholar.

2) Concept map (e.g. circles and lines or equivalent) of broad research frameworks (25%) - roughly the first 5 weeks. Instructor will provide readings.

- Students construct weekly informal concept maps that can contribute to a larger class concept map. Submit one per week the day before class.
- Questions guiding reading and mapping of broad theoretical framework articles
 1. What are the key characteristics (basic beliefs) of the framework?
 2. What counts as evidence in this framework?
 3. What assumptions about knowing and knowledge does the framework include? (Are there other assumptions made by the framework? What bias may this framework show?)
 4. What are the limitations of the framework?
 5. Are there particular types of research (methodologies) that align with this framework?
 6. In what context did this framework develop/evolve and in response to what?

3) Student-led discussion of finer-grained framework (20%) Student groups lead discussion around new “sub” frameworks or data analysis using previously studied frameworks. Students may select papers/articles on math/science.

4) Final presentation of Research findings (25%). The purpose of this assignment is to leverage a theoretical perspective in framing and reporting a small study. This gets at the relationship with theoretical framework, research question(s), and research methodology.

*All assignments must be submitted by the due date listed on the schedule. Assignments will be graded using categories of grades (e.g., 100%, 95%, 90%, 85%, 80%) instead of smaller categorizations.

Grading Scale (I will round to the nearest whole number)

A	93 - 100%	B-	80 – 82	D+	67 – 69
A-	90 - 92%	C+	77 – 79	D	63 – 66
B+	87 – 89%	C	73 – 76	F	<63
B	83 – 86%	C-	70 – 72		

Expectations:

It is expected that you show up on time, prepared for class by completing all assignments for the week. You are also expected to share your ideas and challenge other people’s ideas. The intention is to create an intellectually stimulating, safe, and respectful class atmosphere. So while I expect you to critique and defend ideas, this should be accomplished in a manner that respects other opinions and positions. Canvas is used as a course hub for information (e.g. syllabus, readings, and assignments). It is expected that you check Canvas weekly for updates. For each hour of lecture equivalent, students should expect to have a minimum of two hours of work outside class.

Attendance:

It is expected that you attend class. If you are not in class you will not get credit for the participation points for that session. Make up of these assignments will only be allowed in unique circumstances as outlined in

Academic Regulation #72 <http://www.catalog.wsu.edu/General/AcademicRegulations/ListBy/72>. If you are unable to attend class, it is expected that you will let the instructor know before class by email.

Reasonable Religious Accommodation:

Washington State University reasonably accommodates absences allowing for students to take holidays for reasons of faith or conscience or organized religious activities conducted under the auspices of a religious denomination, church, or religious organization. Reasonable accommodation requires the student to coordinate with the instructor on scheduling examinations or other activities necessary for course completion. Students requesting accommodation must provide written notification within the first two weeks of the beginning of the course and include specific dates for absences. Approved accommodations for absences will not adversely impact student grades. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the period of absence. Students who feel they have been treated unfairly in terms of this accommodation may refer to Academic Regulation 104 - Academic Complaint Procedures.”

Students with Disabilities:

Students with Disabilities: Reasonable accommodations are available for students with documented disabilities or chronic medical conditions. If you have a disability and need accommodations to fully participate in this class, please visit the Access Center website to follow published procedures to request accommodations: <http://www.accesscenter.wsu.edu>. Students may also either call or visit the Access Center in person to schedule an appointment with an Access Advisor. Location: Washington Building 217; Phone: 509-335-3417. All disability related accommodations MUST be approved through the Access Center. Students with approved accommodations are strongly encouraged to visit with instructors early in the semester during office hours to discuss logistics. For more information contact a Disability Specialist on your home campus.

- **Pullman or WSU Online:** 509-335-3417, Washington Building 217; <http://accesscenter.wsu.edu>, Access.Center@wsu.edu
- **Spokane:** <https://spokane.wsu.edu/studentaffairs/disability-resources/>
- **Tri-Cities:** <http://www.tricity.wsu.edu/disability/>
- **Vancouver:** 360-546-9138, <http://studentaffairs.vancouver.wsu.edu/student-resource-center/disability-services>

Academic Integrity:

Academic Integrity is the cornerstone of higher education. As such, all members of the university community share responsibility for maintaining and promoting the principles of integrity in all activities, including academic integrity and honest scholarship. Academic integrity will be strongly enforced in this course. Students who violate WSU’s Academic Integrity Policy (identified in Washington Administrative Code (WAC) 504-26-010(3) and -404) will receive an F grade for the course and will be reported to the Office of Student Conduct. Cheating includes, but is not limited to, plagiarism and unauthorized collaboration as defined in the Standards of Conduct for Students WAC 504-26-010 (3). You need to read and understand all of the definitions of cheating: (<http://app.leg.wa.gov/WAC/default.aspx?cite=504-26-010>). If you have question about what is and is not allowed in this course you should ask the course instructor before proceeding. If you wish to appeal a faculty member’s decision relating to academic integrity please use the form available at conduct.wsu.edu.

Cheating on an exam or an assignment (including plagiarism) will result in a final grade of F for the entire course, will be reported to the Office of Student Affairs, and will result in additional disciplinary action by the University.

Safety and Emergency Notification:

Classroom and campus safety are of paramount importance at Washington State University, and are the shared responsibility of the entire campus population. WSU urges students to follow the “**Alert, Assess, Act,**” protocol for all types of emergencies and the “[Run, Hide, Fight](#)” response for an active shooter incident. Remain **ALERT** (through direct observation or emergency notification), **ASSESS** your specific situation, and **ACT** in the most appropriate way to assure your own safety (and the safety of others if you are able).

Please sign up for emergency alerts on your account at MyWSU. For more information on this subject, campus safety, and related topics, please view the [FBI’s Run, Hide, Fight video](#) and visit the [WSU safety portal](#).

Tentative Schedule

Wk	Date	Topic	Assignment Due Dates
1	1/15	Introduction and Course Planning	*each week you will be graded on participation (assignment #1)
2	1/22	Constructivism, Cognitivism, and Socioculturalism	Concept map due on readings (Assignment #2)
3	1/29	Distributed, Situated, and Embodied Cognition	Concept map due on readings (Assignment #2)
4	2/5	Grounded Theory	Concept map due on readings (Assignment #2)
5	2/12	Critical Theory	Concept map due on readings (Assignment #2)
6	2/19	Summary Reading of Research Paradigms	Concept map of integrated broad frameworks due (Assignment#2)
7	2/26	Summary Reading of Research Paradigms	
8	3/4	Student led discussions (1 group per week)	Student-Led Discussion #3 Due
9	3/11	Student led discussions (1 group per week)	
Spring Break – No class this week (3/18)			
10	3/25	Student led discussions (1 group per week)	
11	4/1	Student led discussions (1 group per week)	
12	4/8	Student led discussion	
13	4/15	Exploring unanswered questions and Applying frameworks to data	
14	4/22	Exploring unanswered questions and applying frameworks to data	
15	4/29	Final Presentations of research findings	Final Presentations #4 Due