Course Title: Epistemic Cognition in STEM Education Research: Theories, Debates, and Methods

Course Information

Course Number: SCE206.2
Instructor(s): Prof. Ayush Gupta (ayush@hbcse.tifr.res.in)
Credits: 4
Course Day and Time: Mondays (11 AM to 1 PM) and Thursdays (11:30 AM to 1:30 PM)
Starting from January 13, 2025

Course Outcomes:

- Students will develop an understanding of major frameworks on epistemic cognition within STEM education research
- Students will be able to engage with the critical debates on epistemic cognition within STEM education research
- Students will develop an understanding of methods & analysis methodologies employed in research on epistemic cognition
- Students will learn how to plan and execute a pilot project investigating some aspect of epistemic cognition
- Students will be able to apply education research methods and methodologies towards their own investigations

Course Outline:

Epistemic cognition is one of the important lines of research in discipline-based education research (DBER) and STEM education research more broadly. Within STEM education research, epistemic cognition is used to refer to a range of phenomenon pertaining to learners' knowledge about knowing and learning within a discipline. In this course, students will engage with various perspectives on epistemic cognition in DBER and learning sciences. Students will also engage with the specificities of the methods that the researchers are using. The course will cover the history of the development of research on epistemic cognition in DBER, stage based and dynamic systems models of epistemic cognition, epistemological dynamics in learning STEM, epistemic framing, epistemic cognition and metacognition, epistemic cognition and emotions/affect, epistemic cognition of teachers, epistemic cognition and design research, and explore connections between the research on epistemic cognition in DBER with that in the learning sciences.

Technology Use in Class

Students are required to bring their laptops or tablets to class for in-class activities. We will use Google Classroom for course management. The use of generative AI for class assignments is not permitted.

Policies

Attendance is required. If you are unable to attend class for some reason, please email me in advance to work out a way to make up for the missed class.

Assignments should be submitted by due dates announced in class. Please take prior permission for delayed submissions.

In case you cannot inform me in advance about an absence or delayed assignment, please email me as soon as you can, so we can work out a way for you to make up for missed classes/assignments.

You can discuss assignments with others, but the actual submission should be your own writing. The use of generative AI for class assignments is not permitted.

You are expected to come to class prepared, having read assigned readings. You are expected to participate actively in class discussions.

Course Schedule

Mondays: **Lectures**
Thursdays: **Discussion Sessions**

Weeks	Topics
Week 1, 2	Introduction to Epistemic Cognition; History; Overview of theories and methods
Week 3, 4	Epistemic beliefs vs dynamic-systems models of epistemic cognition
Week 5, 6, 7	Developments in Epistemic cognition in DBER
Week 8	Course Project: Proposal presentations
Week 9, 10	Epistemological framing and epistemic games (Towards socio-cultural models of epistemic cognition in DBER)
Week 11	Interrogating methods for investigating epistemic cognition
Week 12	Designing instruction to support epistemological development
Week 13	Course Project: Initial Analysis
Week 14, 15	Epistemic Cognition, Metacognition, and Emotions
Week 16	Epistemic Agency

Assessment/Grading Scheme:

Assignment	% Grade	Description	Due
Effort and Class Participation	30%	Students are expected to finish readings before class, and actively participate in class discussions and activities	–

Written Reflections	20%	Students will submit a weekly reflection (1 page) on a specific reading or takeaways from class discussions	Sundays, 10am

Course Project	50%	This is a multi-part semester long assignment
		
		1. Proposal [10%]
		   a. Class Presentation
		   b. Proposal Memo (1-pg)
		2. Pilot Data Collection [10%]
		   a. Data Collection Memo (1-pg)
		3. Initial Analysis [10%]
		   a. Class Presentation
		   b. Initial Analysis Memo (1-pg)
		4. Relevant Literature Review Memo [10%]
		   a. 2-3 pg writeup
		5. Final Analysis Memo [10%]
		   a. 2-3 pg writeup
			1a. Proposal Presentation: March 3rd
			
			1b. Proposal Doc: March 6th
			
			2. Pilot Data + Data Memo: March 15th
			
			3. Initial Analysis Presentation + memo: March 30th
			
			4. + 5. Final Analysis Memo and Lit Review Memo: April 30th

References:

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