COLLEGE OF
Engineering, Computer Science, and Technology

Seminar in Interdisciplinary STEM Research

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HOSTED BY CREST-CATSUS AND SIKAND SITI CENTERS

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Ji Yun Son is Professor of Psychology and Director of the Learning Lab at California State University, Los Angeles. She co-authored the interactive textbook Statistics and Data Science: A Modeling Approach (CourseKata.org), used by over 150 institutions and more than 34,000 students. She earned her PhD in Cognitive Science and Psychology from Indiana University, Bloomington. Ji's research focuses on how learning changes the way we see the world. She applies insights from the learning sciences to improve teaching, learning, and educational research—particularly in mathematics, statistics, and data science. Her work emphasizes scalable, evidence-based strategies to support student success, especially for historically marginalized students.

How to Teach Students Hard Things: Making R&D Work for Education

We want students to see science and mathematics not as collections of formulas and procedures, but as ways of thinking that help them make sense of the world. Yet too often, introductory courses are experienced as fragmented, algorithmic, and ultimately forgettable. Students learn to solve familiar problem types without developing the conceptual structures that allow them to transfer that knowledge to new situations. Cognitive science has a great deal to say about why this happens and how to remedy this. Research on transfer consistently shows that students generalize when they compare meaningful cases, attend to deep structure rather than surface features, and encounter ideas embedded in coherent causal stories. The challenge is not identifying these principles. The challenge is building courses that reliably embody them at scale. In this talk, I will describe CourseKata, a statistics and data science curriculum developed and improved through a long-term partnership among instructors, researchers, and developers. Originally designed around core learning science principles—such as organizing ideas around a unifying conceptual framework (e.g., DATA = MODEL + ERROR)—the curriculum is continuously improved using data from thousands of authentic student responses. Through an iterative continuous improvement process, the CourseKata community has implemented hundreds of improvements in materials used by thousands of intro stats students, ranging from small representational changes that improved a targeted conceptual outcome to larger structural reorganizations that reduced equity gaps. Although the examples come from introductory statistics, the broader argument applies across the sciences: if we want students to think like scientists, we must design courses that make that transferrable structure visible and interconnected with the change they want to make in the world. In other words, the improvement of science education should itself be treated as an R&D enterprise.

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