

Learning Sciences Labs and Research Groups | 2023-2024

FACULTY-LED GROUPS

Equity in Learning Landscapes Lab

Faculty Leader: Nichole Pinkard

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The Equity in Learning Landscapes Lab works with communities to reimagine their use of civic learning spaces (i.e., parks, libraries, community colleges, and community centers) to support residents across their lifespans in engaging in joyful STEAM learning and leisure experiences. Our lab provides enterprise-level sociotechnical systems to document, visualize, and analyze inequity in opportunity and the systemic structures and policies (e.g., redlining, school assignment) that have historically mediated access. While supporting communities in analyzing their landscape through their unique lens, the lab explores inequity of access through the lens of families raising Black daughters. We seek to develop a learning landscape and needed support tools to enable black girls to enter high school with healthy STEAM identities, a supportive network of peers and caring adult, and the knowledge of their STEAM superpowers and kryptonite. We are expand our methodological toolset to include social network and geospatial analysis to study the impact of place learning opportunity.

TREE Lab (Technology, Race, Equity, & Ethics in Education Lab)

Faculty Leader: Sepehr Vakil

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The TREE Lab within the School of Education and Social Policy is an NSF-funded initiative that brings together NU undergraduate students with youth and community members to jointly investigate ethical, social, and racialized dimensions of new technologies. Our lab designs tools and environments that facilitate engagement with complex technologies in ways that make visible their sociopolitical and ethical dimensions and implications. We draw on a range of conceptual and methodological approaches including critical theory, learning sciences, HCI, sociocultural theory, and participatory design.

TIDAL Lab (Tangible Interaction Design and Learning Laboratory)

Faculty leader: Michael Horn

Website: <https://tidal.northwestern.edu>

Contact: michael-horn@northwestern.edu, wadeberger2023@u.northwestern.edu

TIDAL Lab is a team of designers, artists, learning scientists, and computer scientists at Northwestern University. Our research creates and studies innovative technology-based learning experiences. We take

a cautious but optimistic stance towards technology in a process that tightly couple research and design. Our work on the [TunePad](#) project introduces students to digital music production using Python code.

Reading Comprehension Lab

Faculty leader: David Rapp

Website: <https://rapplab.sesp.northwestern.edu>

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Comprehending and learning from texts we read, conversations we participate in, maps we study, and presentations we view requires unlocking the meanings associated with ideas, words, images, icons, and grammar. Research in our laboratory focuses on the nature of such comprehension by describing the activities and processes that comprise it. We also seek to facilitate these activities and processes by understanding comprehension difficulties and, with that knowledge, designing effective learning interventions. Recent work has examined causes, consequences, and remediations for experiences with inaccurate information, fake news, and misinformed beliefs.

Delta Lab

Faculty leaders: Nell O'Rourke, Matt Easterday

Website: delta.northwestern.edu

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Delta Lab (is an interdisciplinary research lab and design studio lab of researchers in Education, Computer Science, Design and Communications (Easterday, O'Rourke, Zhang, & Gerber). Our driving mission is to improve the way we learn, design, work, and play by fundamentally changing how individuals and communities interact. Taking a unique interdisciplinary and collaborative approach, we tackle exciting research problems in the areas of project-based learning, student motivation, learning communities, educational games, and networked classrooms. We target diverse learning domains such as civics, entrepreneurship, computational thinking, and journalism. Delta Lab students use qualitative and quantitative methods to study the design of novel learning environments enabled by digital media, online communities, computer-supported collaborative learning, games, artificial intelligence and crowdsourcing. We deeply value graduate student learning and community. We provide all our students with support through extensive one-on-one mentoring, peer collaboration, group workshops and feedback sessions. Delta students conduct research with visible social impact and publish in prominent LS journals and conferences such as the Journal of Learning Sciences, Cognition and Instruction, Instructional Science, International Journal of Artificial Intelligence in Education, Transactions of Human Computer Interaction, International Conference of Learning Sciences, and Computer Supported Collaborative Learning. Our students have won prestigious fellowships and research awards (including 5 NSF Graduate Student Fellowships), and have gone on to become professors, start companies and nonprofits, and lead innovative initiatives at companies such as Google, Facebook, Microsoft, Disney, and Adobe.

Freezing Time Research Group

Faculty leaders: Jen Munson, Jennifer Richards, Bruce Sherin, Miriam Sherin

Website: <https://www.freezingtime.sesp.northwestern.edu/>

Contact: freezingtime@u.northwestern.edu

The Freezing Time Research Group at Northwestern University is driven by a shared understanding of the importance of mathematics and science teachers attending substantively to students' thinking and of the complexity of doing so. Group members investigate what teachers pay attention to in classrooms and

how they make sense of and respond to what they notice. We explore new research methodologies and video technologies to access teachers' thinking about pedagogically relevant moments in the classroom.

We meet weekly to discuss research directions, works in progress, and other areas of professional practice. Anyone is welcome; please check out the website or contact us for more information.

Technological Innovations for Inclusive Learning and Teaching (tiilt) Lab

Faculty Leader: Marcelo Worsley

Website: tiilt.northwestern.edu

Contact: marcelo.worsley@northwestern.edu

The Technological Innovations for Inclusive Learning and Teaching (tiilt) Lab aims to improve learning opportunities for students from under-served communities. Our work with technological innovations includes: 1) co-designing activities with teachers and learners; 2) creating interfaces that broaden participation in meaningful learning experience; and 3) tools and analytic techniques for studying and supporting complex learning environments. We position our work as inclusive, in that we endeavor to address historic and contemporary disparities in inclusivity and social, racial and economic inequity. Furthermore, we work with teachers, students, community members and parents, in hope of supporting the development of positive learning ecosystems.

Qualitative Reasoning Group

Faculty Leader: Kenneth D. Forbus

Website: <http://www.qrg.northwestern.edu>

Contact: forbus@northwestern.edu

The Qualitative Reasoning Group conducts research on:

- Qualitative representations and reasoning, for capturing both everyday reasoning and expert reasoning about quantities, space, time, and causality.
- Sketch understanding, to create systems that can participate in sketching with people, and to model how visual, spatial, and conceptual processing combine to understand sketches.
- Analogical reasoning and learning, for being able to reason with, and learn from, examples and stories.
- Learning by reading, to discover how systems can extend their knowledge by understanding texts and diagrams.
- How our progress in AI and cognitive science can be used to create new kinds of systems for education, performance support, and interactive entertainment.

Our research includes efforts to both create new kinds of cognitive systems and model human cognition. We have strong collaborations with other cognitive scientists in a number of fields at various institutions.

The Center for Connected Learning and Computer-Based Modeling (CCL)

Faculty leader: Uri Wilensky

Website: <https://ccl.northwestern.edu/>

Contacts: uri@northwestern.edu

Post-doctoral scholar: [Amanda Peel](#)

The CCL is dedicated to the creative design and use of technology to deepen learning. Members of the lab are typically involved in the design of new environments for learning. The lab works closely with many school partners as well as museums and other informal learning spaces. The CCL is a community

comprised of LS & CS graduate students, post-docs, software development staff and undergraduate interns. Professor Michael Horn is also a member as is visiting professor Sharona Levy. Members of the CCL work in a variety of areas including STEM education, complex systems, policy research, agent-based modeling and constructionist learning environments. The design research is implemented in schools in conjunction with teachers and in informal learning environments such as museums and video games. A major focus of the CCL is on the integration of computational modeling (e.g., our widely used [NetLogo](#) software) into curriculum and more broadly in natural and social science. The Lab explores how new representational systems can fundamentally change the way we think and reason about content domains. In this way, traditionally complex domains can be democratized for all learners. The CCL is also involved in several projects on computational thinking in STEM fields and in social sciences (e.g., CT-STEM). The lab is committed to the design of “low floor, high ceiling” tools and learning environments that are easy to get started with yet enable users to create powerful and complex constructions. Graduates of the CCL have won many awards and have gone on to prominent positions in academe and industry.

Visual Thinking & Imagination Lab

Faculty Leader: Steven Franconeri

Website: <http://viscog.psych.northwestern.edu/>

Contact: franoneri@northwestern.edu

We study how leveraging the visual system - the largest single system in your brain - can help people think, remember, and communicate more efficiently. Our basic research is inspired by real-world problems, guiding our laboratory toward the most interesting basic research questions, while producing results that translate directly to science, education, business, & design.

Everyday Learning

Faculty leader: Reed Stevens

Contact: reed-stevens@northwestern.edu

The focus of the Everyday Learning group is to understand learning and cognition in everyday life. Members of the Everyday Learning group conduct basic field studies in everyday cultural contexts such as families, schools, work, and play to understand how learning, teaching, and cognition are organized, socially and materially. These understandings often provide inspiration for the design of new learning environments; one example of such a learning environment designed from basic field studies of everyday learning is FUSE Studios (<https://www.fusestudio.net/>). Research methods used by the group involve a variety of ‘experience near’ ethnographic methods, with a specialization in video based interaction analysis. We also discuss a range of texts from both academic and mainstream sources. Meetings are held weekly and anyone is welcome to join.

Coburn Projects

Faculty leader: Cynthia Coburn

Contact: cynthia.coburn@northwestern.edu

Participating students are involved in one of three lines of work related to policymaking and policy implementation, often related to mathematics instruction:

- 1) COHERE: a study of efforts to promote preK-3 alignment in mathematics in district, school, and classroom under the auspices of the DREME Network (<https://dreme.stanford.edu>)
- 2) Crafting coherence: A study of California Education Partners’ partnerships to foster preK-3 coherence in mathematics with four small-to-midsize school districts in California

- 3) National Center for Research in Policy and Practice: Two studies (one with Jim Spillane) about the role of research and other forms of information in district and school decision making (<http://ncrpp.org/>)

All projects are currently in data analysis phase. We welcome those who are interested in working independently or as part of the team to investigate a range of question using our existing project data.

Spillane's Education System Building for Equitable and Excellent Instruction Lab

Designing School Systems to Support Next Generation Science Standards (NGSS)

Faculty leader: Jim Spillane

Postdoctoral Fellow: Christa Haverly

Contacts: j-spillane@northwestern.edu or zena.ellison@northwestern.edu

This study, funded by the National Science Foundation, examines the work of designing education systems to support ambitious elementary science instruction. In collaboration with the University of Michigan, the purpose of this study is to produce fundamental research on the work of developing school-level and system-level STEM learning environments that bridge from the Next Generation Science Standards (NGSS) as an aspirational policy to high quality science instruction in elementary school classrooms. The project team meets remotely once a week at a time determined at the beginning of each quarter.

NebraskaMATH Study

Faculty leader: Jim Spillane

Website: www.distributedleadership.org

Contact: J-spillane@northwestern.edu, zena.ellison@northwestern.edu

The NebraskaMATH study, funded by the National Science Foundation, is a collaboration with the University of Nebraska at Lincoln. The project aims to improve achievement in mathematics for all students and narrow achievement gaps among at-risk populations. We have collected several years' worth of both qualitative and quantitative data from teachers and other school staff and are now mostly working on analyses. This study includes graduate students in SESP and faculty with appointments at George Washington University's Graduate School of Education and Human Development and at UC San Diego's Department of Education Studies.

The Comparative School Systems Lab

Faculty leader: Jim Spillane

Contact: J-spillane@northwestern.edu, zena.ellison@northwestern.edu

This study, funded by the Spencer Foundation, is a collaboration with the University of Michigan. School system building has become central to educational reform in the US. As reformers and policymakers envision systems as powerful sources of instructional improvement a critical question is: How do school systems define, design, manage, and improve instruction? We research how six school systems define, design, and manage instruction and instructional improvement. We want to learn about how *systems* interact with and affect instruction, maintain instructional quality, and enable instructional improvement.

MoDAL

Faculty Leaders: Eva Lam and Jolie Matthews

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We share and collaborate on work that engages with cultural diversity and learning, with a converging interest in language and semiotic practices or literacy practices related to diverse media. We have also discussed converging interests in narrative, critical literacies, identity, and multimodality. We define literacy as how people use communication tools to represent and build knowledge and social relations. We are interested in understanding and designing contexts of literacy learning with diverse media - old, new and emerging - and especially those that afford transformative potentials for cultural expression and political engagement.

Uttal Lab

Faculty leader: David Uttal

Website: <https://uttallabs.northwestern.edu/>

Contacts: duttal@northwestern.edu, camille.msall@northwestern.edu

The Uttal Lab meets weekly (day/time TBD). At these meetings, students from both Learning Sciences and Psychology share research on cognitive development, symbol and map understanding, spatial thinking, STEM learning, and attitudes toward spatial thinking and STEM. Students in our research group do both qualitative and quantitative research in a wide variety informal and formal learning environments (e.g. classrooms, museums, laboratory) and with a wide variety of age groups (from toddlers to college students).

Developing a Model of Teacher Learning to Support Classroom Enactment of Purposeful Sensemaking

Faculty Leader: Brian Reiser

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Meets: Tuesdays 11:00am-12:30pm

This project investigates teacher learning in the context of enactment of instructional materials aligned to the three dimensions of the Framework for K-12 Science Education and the Next Generation Science Standards (NGSS). We have operationalized a major shift called for in the current reform context in an approach we call purposeful sensemaking, in which teachers and students co-construct a knowledge building environment. We are studying several cohorts of teachers over a two-year timespan during which they learn about and teach with instructional materials designed to support purposeful sensemaking. Our goal is to develop a model for understanding how enactment is influenced by and in turn influences underlying conceptions and practices of science teaching. The project explores variations that occur in teachers' attempted enactments of a semester-long sequence of middle or high school curriculum and examines how these variations arise from teachers' underlying knowledge, beliefs, and practices, and how they coordinate those ideas during enactment in specific contexts. The project aims to develop a model of teacher "learning while doing" identifying the shifts in knowledge, beliefs and practices that teachers make over time, and describe how the process of using NGSS-aligned instructional materials creates the conditions for teacher learning. Project goals are to model the substance of what teachers have learned and model the mechanism by which these changes arise through cycles of analysis, enactment and reflection. The project is a collaboration with University of California Davis (PI Cindy Passmore) and University of Colorado Boulder (PI Bill Penuel).

OpenSciEd Middle School

Faculty Leader: Brian Reiser

Contacts: reiser@northwestern.edu or michael-novak@u.northwestern.edu

OpenSciEd is a consortium of 10 state education agencies working with school districts, classroom educators, science education researchers and developers, that is working to create and field test a complete set of robust, research-based, open-source science instructional materials that are aligned to the Framework and NGSS and accessible to all students. The project aims to build implementation supports and demand for the research-based high-quality instructional materials in tandem. The goals are (a) Ensure any science teacher in the U.S. can access and download free Framework and NGSS-aligned instructional materials; (b) Allow districts and schools to shift focus from developing aligned materials to professional learning for science teachers and leaders around quality instructional materials; (c) Provide space for states and districts to work with other organizations to collaborate on innovative approaches to professional learning for science teachers and leaders. Our team is collaborating with BSCS Science Learning to serve as the Instructional Materials Development Center, and with Boston College to participate in the design of professional learning supports. Our current field trials involve 228 teachers and 5,800 students from 100 schools in 10 states. Our empirical work is examining the usability of the materials, and more important students' sense of ownership in their own learning, engagement, and collaboration with their peers.

Multidisciplinary K-5 units to support understanding, agency, and social-emotional learning about COVID19

Faculty Leaders: Brian Reiser, Megan Bang

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The COVID-19 pandemic raises important challenges for teachers to support their students in multiple areas of necessary learning. The pandemic is a clear example of how science and society are interrelated. Researchers at Northwestern University in collaboration with the University of Washington have developed classroom resources to support teachers in working with their students to understand and deal constructively with these issues. These materials are designed to support teachers in grades K through 5 in working with their students to provide three areas of support: (a) support kindergarten through fifth grade students in understanding how pandemics can occur and practices that they and their community can take to respond to the personal and public health needs of a pandemic; (b) foster empathy, strategies for productive responses to fear and concerns, and agency in cultivating healthy and ethical social relations; (c) support students in understanding how societal structures can mediate pandemics and their effects. The materials are being released free to teachers, available for download through OpenSciEd, in September 2020. This study examines a sample of teachers who have chosen to use these materials with their students and collect data from these teachers about their experiences using the materials with their students and their families. The study examines teachers' experiences working with these curriculum materials to address these research questions: How do students learn how pandemics can occur, and learn practices that they and their community can take to respond to the pandemic? How well does the unit foster empathy and agency in cultivating healthy and ethical social relations? How do students learn how societal structures can mediate pandemics and their effects? What challenges emerge for teachers in trying to use curriculum materials that support students in learning about health inequities?

Gikendan Lab

Faculty Leader: Megan Bang

Contacts: megan.bang@northwestern.edu or Jennie Woodring j-woodring@northwestern.edu

Meets: Thursdays 1-2:30, 3:00-5:00 and Fridays 9:30-11

Current projects include:

ISTEAM

The Indigenous Science, Technology, Engineering, Arts, and Math project utilizes cognitive and community co-design research to advance general knowledge, develop pedagogical approaches for engaging youth in land- and water-based learning, and provide learning materials to Indigenous families. We investigate how people reason about relationships in the natural world and develop teaching approaches to enhance learning. We apply what we learn to the development of learning tools for Indigenous youth and families, through collaboration with community organizations, educators, and families. Our research and collaborations are currently funded by a grant from the National Science Foundation. Learn more at our [website](#).

LEARNING IN PLACES (LiP)

With our collaborators at University of Washington, Bothel, we co-design innovative research and practice with educators, families, and community partners that cultivates equitable, culturally based, socio-ecological systems learning and sustainable decision-making utilizing “field based” science education in outdoor places, including gardens, for children in Pre-K to 5th grade and their families. Learn more at our [website](#).

IUSE (Improving Undergraduate Stem Education)

With our colleagues at University of Washington, Bothel and science faculty from across life, physical, and earth sciences, we are co-designing a 2-quarter undergraduate course sequence that engages prospective elementary school teachers in a project-based, interdisciplinary science content course that incorporates contemporary issues, practices, and ethics of science, situated within the economic, social, and political contexts in which science and science decision-making always live. The content will foreground anti-racist pedagogies to highlight the ways in which science has been used as both a means of oppression of Black, Indigenous, and other people of color (BIPOC) and as a tool for advancement.

Vossoughi Research Lab

Faculty Leader: Shirin Vossoughi

Contacts: shirin.vossoughi@northwestern.edu

Meets: Mondays 5-6:30 pm; Tuesdays 10-11:30; Thursdays 9:30-11am, 11:45am-2pm

Current projects include:

METAMEDIA Partnership & Research/Design project

This long-term community based research project engages in the design and study of justice-oriented learning in a 6-week summer program serving Black and Latinx middle school students in Evanston. Weaving together STEAM learning, storytelling, and writing, the design cultivates conditions for robust forms of student and educator learning as tied to the nourishment of social, pedagogical, and artistic imagination. The research works to study and render these processes of learning and transformation over time in close partnership with educators.

Iranian Parenting and Worldmaking

This project traces the long arc of human learning and social change by studying parenting and political education among Iranian families across time and place. We are studying the forms of learning Iranian elders experienced as part of social movements and their variegated afterlives, including how their children and grandchildren are building on, wrestling with, and recreating their cultural and historical inheritances.

LEARNING IN PLACES (LiP) [with Megan Bang, PI]

With our collaborators at University of Washington, Bothel, we co-design innovative research and practice with educators, families, and community partners that cultivates equitable, culturally based, socio-ecological systems learning and sustainable decision-making utilizing “field based” science education in outdoor places, including gardens, for children in Pre-K to 5th grade and their families. Learn more at our [website](#).

STUDENT GROUPS

Critical Contexts

Student contacts:

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Critical Contexts is a multidisciplinary student-led scholarly community that centers graduate students with important bridges to the broader NU [and Chicagoland] community. Critical Contexts’ origins in SESP guides three primary foci in our collective work including 1) reimagining research and theory to speak to social responsibility, equity, and critical perspectives; 2) taking action on the interlocking roles of capitalism, settler colonialism, anti-Blackness, white supremacy and other western heteropatriarchal hegemonic forces in relation to our work in and outside of the academy; and 3) providing a supportive, transformative, and effervescent space primarily for students of color and other marginalized students to share their experiences and collectively work towards building academic pathways that are life-affirming and research stimulating.

Every quarter this voluntary group sets a weekly meeting time and plans out a series of discussions, readings, and student presentations. We typically check in with each other, have snacks, and a good time alongside these discussions. We routinely consult faculty from the Learning Sciences, Human Development and Social Policy, and Psychology departments; organize annual writing retreats; and engage in community actions.

** Many faculty members do not have official research groups. Faculty not listed are nevertheless open to meetings and discussions. If you have an interest in particular faculty members you should not hesitate to email them or talk to their students.*