

LEARNING SCIENCES

Degree Types: PhD, MA

The Interdisciplinary Learning Sciences Program (<https://www.sesp.northwestern.edu/learning-sciences/>) prepares researchers, developers, and practitioners to advance the scientific understanding and practice of teaching and learning.

Through coursework and research apprenticeships, students engage in three facets of learning sciences research and theory:

- **Cognition:** Scientific models of the structures and processes of learning and teaching.
- **Sociocultural context:** Social, organizational, and cultural dynamics of learning and teaching.
- **Design:** Building environments for learning and teaching.

Students participate in frontier investigations in schools, workplaces, and other settings. The program emphasizes the design and use of technologies as a component of innovation and educational reform.

Learning Sciences faculty consider learning and teaching from a diversity of theoretical and methodological perspectives including artificial intelligence, cognitive and developmental psychology, computer science, and educational research.

Additional resources:

- Department website (<https://www.sesp.northwestern.edu/learning-sciences/>)
- Program handbook(s)

Degree Offered

- Learning Sciences PhD (<https://catalogs.northwestern.edu/tgs/learning-sciences/learning-sciences-phd/>)

Learning objective(s)/Students should be able to...

- Contribute original research to the scholarly community.
- Students will have familiarity with the three stands of the learning sciences: cognition, social & cultural context, and design.
- Students will have familiarity with a breadth of learning sciences research methods including qualitative, quantitative, and computational methods.
- Students will demonstrate proficiency applying at least one learning sciences research methods in a real research context.
- Students will be able to conduct independent research.

Learning Sciences Courses

LRN_SCI 401-0 Knowledge Representation for the Learning Sciences (1 Unit)

Theoretical and methodological techniques for knowledge representation, primarily as practiced by cognitive scientists. Application of these techniques to issues of learning that are of interest to researchers in the learning sciences.

LRN_SCI 402-0 Social Dimensions of Teaching & Learning (1 Unit)

Students' relationships with one another and with teachers in school and nonschool settings. Implications for classroom instruction of social learning theory, student diversity, classroom climate, cooperative

and competitive goal structures, and processes of attribution and achievement motivation.

LRN_SCI 403-0 Foundations of the Learning Science (1 Unit)

Cognitive and social science theories of how people learn to understand, reason, and solve problems. Implications for the design of classroom learning environments; learning in real scenarios for investigating central issues in cognitive science. Learning in mathematics, science, reading/writing, and informal reasoning.

LRN_SCI 404-0 Methods and Epistemologies for the Study of Learning I (1 Unit)

This course focuses on the development of research questions and understanding the range of possible methodological approaches to understanding learning based on those questions.

LRN_SCI 405-1 Methods and Epistemologies for the Study of Learning II (1 Unit)

LRN_SCI 410-0 Quantitative Methods I: Probability and Statistics (1 Unit)

LRN_SCI 411-0 Quantitative Methods II: Regression Analysis (1 Unit)

LRN_SCI 413-0 Tangible Interaction Design and Learning (1 Unit)

This course will explore the use of tangible interaction to create innovative learning experiences. It will review both theoretical and technological foundations of the field. Topics include creative expression, embodied interaction, cultural forms, and design frameworks.

LRN_SCI 415-0 Field Methods (1 Unit)

The purpose of this course is to introduce students to the world of qualitative research so that they will be able to read qualitative studies intelligently, and learn to design and conduct qualitatively oriented studies themselves. Beginning with an overview of the epistemological assumptions behind different kinds of research, the course will explore various types of qualitative research approaches and the kinds of topics and queries they support. Students will read and critique examples of published research of various kinds. Next, students will investigate the various methods of collecting qualitative data. The class is designed so that students simultaneously read about and discuss qualitative research, and gather data themselves. Although the course touches on analysis, the main focus is on developing a qualitative research project and collecting data for it.

LRN_SCI 416-0 Advanced Qualitative Methods (1 Unit)

LRN_SCI 417-0 Indigenous Methods in Research (1 Unit)

This introductory course will explore the foundations of Indigenous methodologies. The course will be grounded in several core texts that orient students to the history of and development of Indigenous methodologies in research. As part of this work students will examine the legacies of research in Indigenous communities and how Indigenous methodologies offer important paradigms in the development of research. Further students will explore the ethics of knowledge production and its contributions to Indigenous communities - and all communities. Across the course student will develop an understanding of the core dimensions and principles of Indigenous methodologies and have the opportunity to consider the design of research agendas and methods from these principles.

LRN_SCI 418-0 Text Mining (1 Unit)

The course is structured as a progression through different techniques from data mining. But we will be considering, in parallel, applications of those methods to our domains of interest. The primary way in which those applications will be introduced is through article presentations by students in the class. Students will learn to write short programs to

apply text mining to existing data corpora. But no prior experience with programming is required.

LRN_SCI 419-0 Interaction Analysis (1 Unit)

This course is a deep introduction to analyzing recorded interactions. It seeks to hit practical, epistemological, and historical notes. People do the work of everyday life in interaction. Almost everything of consequence happens in interaction: family life, politics, teaching, learning, collaboration, friendship, love, conflict, and self and other identification. The course is organized around readings and doings. Over the quarter, we'll dig into all the elements involved in producing this kind of work, from selecting sites, to making audio-video recordings, to selecting segments for close interaction analysis, and finally to how to assemble completed analyses into articles and chapters. Final projects are directed to students' own research interests and data.

LRN_SCI 422-0 Identity, Power, and the Historical Imaginary (1 Unit)

This class will explore the cultural and cognitive dimensions of how individuals and social structures construct human "identity" and "power" through the lens of the "historical imaginary" (our hegemonic, collective understanding of the past). We will look at examples across various social contexts in and out of school, including but not limited to educational and popular media contexts. We will trace how memory, sense of self, representation practices, and power have been and are produced, reproduced, maintained, and justified to shape perceptions and/or control different identity groups over time.

LRN_SCI 423-0 Design of Learning Environments for Just and Sustainable Futures (1 Unit)

We are living in times of rapid socio-ecological change, systemic destabilization, and sociocultural unrest. Changing climates, environmental degradation, linguistic and cultural genocide, and unsustainable nature-culture relations necessitate new and imaginative ways of seeing, knowing, and being in the world. These challenges present opportunities and responsibilities to consider what forms of education are needed, for whom, in what places, and towards what ends. This course will ground students in several core domains of research on human learning, decision making, and world making. Further the course will integrate design research as a key method that cultivates new possibilities in learning.

LRN_SCI 425-0 Introduction to Design for the Learning Sciences (1 Unit)

Building the skills and knowledge necessary to support the design of educational experiences. Exploration of general design principles and learning sciences theoretical perspectives through examination of existing cases of instructional design. A design project involving needs analysis, specifying learning objectives, and designing a new educational experience.

LRN_SCI 426-0 Design of Technological Tools for Thinking and Learning (1 Unit)

LRN_SCI 429-0 Design of Learning Environments (1 Unit)

Issues in designing and studying innovative learning environments. New models of classroom interaction, particularly using technology to enable new cognitive and social roles for students. Topics include simulations, tutors, computer-mediated communication, project-based learning. Theoretical motivations in cognitive and social-interaction learning theories, empirical studies evaluating their effectiveness, and prospects for propagation of such innovations.

LRN_SCI 434-0 Teacher Thinking & Learning (1 Unit)

Recent research on teacher cognition, how teacher knowledge is organized and accessed, and relationship between knowledge and practices. Investigate novice and veteran teachers learning.

LRN_SCI 437-0 Discourse Analysis (1 Unit)

Discourse Analysis.

LRN_SCI 438-0 Teaching with Technology (1 Unit)

Conceptual strategies for integrating technology into effective pedagogy and practical strategies for employing technology in classrooms. Includes hands-on experience with technology and a design project.

LRN_SCI 442-0 Social Policymaking and Policy Implementation (1 Unit)

LRN_SCI 443-0 Educational Policy: Design, Implementation and Effects (1 Unit)

Introduction to issues in educational reform. Analyzing educational reform; framing educational policy problems; examining reformers' assumptions about the school system, about the roles of school in society, and about teaching and learning. The course is grounded in school decentralization, systemic reform and school choice.

LRN_SCI 446-0 Cognition in Contexts: Ecologies of Learning and Thinking in Everyday Life (1 Unit)

This seminar will explore how learning and thinking are organized in everyday settings. Most academic research on cognition and learning has been conducted primarily in laboratory and school settings; this focus has made for a too narrow conception of what cognition and learning are, titling images of cognition toward the abstract, the individualistic, and the mentalistic. In the wide range of everyday cultural contexts, cognition is unquestionably practical, embodied, distributed, and tuned to ecological niches of cultural consequence. And the organization of learning, over interactional and longer time frames, looks very little like the conventional images of learning in schools—a single 'teacher' instructing and testing a group of individual 'students'. The wide variety of everyday learning arrangements will be a central focus of this class. The course readings are interdisciplinary, drawn from anthropology, sociology, science and technology studies, and the learning sciences. Most are ethnographic case studies, and all seek to balance the empirical and conceptual. This will be a theme of our discussions: how a study is strategically sited and constructed to be rich empirically but also to develop concepts for seeing these and other learning and thinking contexts from new perspectives. The widely used yet underexamined concept of 'context' itself will be a recurrent topic of discussion as well.

LRN_SCI 451-0 Topics in Learning Sciences (1 Unit)

Discussion of trends in the field of Learning Sciences via articles and other resources.

LRN_SCI 452-0 Constructionism Seminar (1 Unit)

Discussion of trends in the field of Learning Sciences via articles and other resources.

LRN_SCI 463-0 Topics in Research Methods (1 Unit)

Methodological approaches to research on learning- teaching environment implementation. Methods for examining processes of change and adoption of educational interventions in various settings. May be repeated for credit with change of topic.

LRN_SCI 472-0 Designing and Constructing Models With Multi-Agent Languages (1 Unit)

Contact the department for further information.

LRN_SCI 477-0 Philosophical & Historical Foundations of Education Reform (1 Unit)

How influential root metaphors for the learner, knowledge, and learning processes become embodied in educational technologies, and how the sociocultural context of their design and use influences their appropriation or rejection.

LRN_SCI 499-0 Independent Study (1-3 Units)

SEE DEPT FOR SECTION AND PERMISSION NUMBERS.

LRN_SCI 519-0 Responsible Conduct of Research Training (0 Unit)

LRN_SCI 590-0 Research (1-3 Units)

Independent investigation of selected problems pertaining to thesis or dissertation. May be repeated for credit. - SEE DEPT FOR SECTION AND PERMISSION NUMBERS.