

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 1 (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 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 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 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.