In the Cognitive Science in Education Program, students examine the cognitive mechanisms that underlie learning and thinking in school and non-school settings. The program trains students in basic theories of human cognition, the practice and interpretation of empirical cognitive and developmental research, as well as how to use research to improve educational practices and develop innovative methods built around new technologies. Studies in cognitive, developmental, and educational psychology and computer science provide students with a valuable perspective on cognition and learning.

The curriculum and program requirements are designed to prepare graduates for careers in several possible settings. For the doctoral programs, work settings after graduation might include: research organizations, or universities seeking faculty in cognitive psychology, educational psychology, educational technology, reading, and learning analytics.

Students in the Cognitive Science in Education Program begin by taking a set of core background courses, then pursue one area of focus: Cognition and Learning, Intelligent Technologies, Reading Research, Cognitive Science of Educational Practice, or Learning Analytics.

In addition, each student registers for research practicum seminars during which they complete a substantive project as a culminating experience for that degree. Choice of advanced courses and research seminars should be shaped by the student's area of focus, as described below. Students whose interests do not fit one of these tracks may design their own area of focus, in consultation with their advisor.
Program Requirements
Doctor of Philosophy: 75 Points

Core Courses (9 points):
All 3 courses are required
- HUDK 4029 Human cognition and learning (3)
- HUDK 4080 Educational psychology (3)
- HUDK 5023 Cognitive development (3)

Statistics (12 points):
Optional:
- HUDM 4120 Basic concepts in statistics (3) (not recommended for those who have taken undergraduate statistics)
Required:
- HUDM 4122 Probability and statistical inference (3)
- HUDM 5122 Applied regression analysis (3)
- HUDM 5123 Linear models and experimental design (3)
- HUDM 6122 Multivariate analysis I (3)

Specialized Courses (minimum of 15 points): Selected in consultation with an advisor, and focusing on one of the following areas of focus:

Cognition and Learning:
- HUDK 4015 Psychology of thinking (3)
- HUDK 4027 Development of mathematical thinking (3)
- HUDK 5024 Language development (2-3)
- HUDK 5025 Spatial thinking (3)
- HUDK 5030 Visual explanations (3)
- HUDM 5058 Choice and decision making (3)
- HBSK 5096 Psychology of memory (3)
- HUDK 5042 Motivation in education (3)
- HUDK 5063 Cognitive development beyond childhood (3)
- HUDK 6199 Issues: Transfer of learning (3)

Intelligent Technologies:
- HUDK 4015 Psychology of thinking (3)
- HUDK 4035 Technology and human development (3)
- HUDK 4050 Core methods in educational data mining (3)
- HUDK 4051 Learning analytics: process and theory (3)
- HUDK 5025 Spatial thinking (3)
- HUDK 5030 Visual explanations (3)
- HUDK 5035 Psychology of media (3)
- HUDK 5037 Psychology of children’s television (3)
- HUDK 5042 Motivation in education (3)
- HUDK 5063 Cognitive development beyond childhood (3)
- HUDK 5197 Psychology of eLearning in business and industry (3)
- HUDK 6199 Issues: Transfer of learning (3)

**Reading Research:**

- HUDK 4015 Psychology of thinking (3)
- HUDK 5024 Language development (3)
- HUDK 5035 Psychology of media (3)
- HUDK 5042 Motivation in education (3)
- HUDK 5063 Cognitive development beyond childhood (3)
- HUDK 5090 Psychology of language and reading (3)
- HUDK 6199 Issues: Transfer of learning (3)
- HBSK 4074 Development of reading comprehension strategies and study skills (3)

**Cognitive Science of Educational Practice:**

- HUDK 4015 Psychology of thinking (3)
- EDPS 4021 Sociology of education (3)
- HUDK 4035 Technology and human development (3)
- HBSK 4074 Reading comprehension strategies and study skills (3)
- HUDK 5042 Motivation in education (3)
- HUDK 5063 Cognitive development beyond childhood (3)
- ORL 5522 Evaluation methods I (3)
- HUDK 6199 Issues: Transfer of learning (3)

**Learning Analytics:**

- HUDK 4050 Core methods in educational data mining (3)
- HUDK 4051 Learning analytics: process and theory (3)
- HUDK 4052 Normative perspectives on the analysis of learning and learners (3)
- HUDK 5053 Feature engineering studio (3)
- HUDK 4054 Managing Education Data (3)

**Research Apprenticeship** (6 points):
Two or more semesters in a research practicum:
- HUDK 6539 Research practicum in educational psychology, cognition, and learning (1-3), taken over multiple semesters for a total of 6 points

**Special Seminars** (minimum of 5 points):
HUD 6500 Doctoral Proseminar (1-2), taken during the Fall and Spring of the first year -- one point during the Fall term and 2 points during the Spring
HUDK 7502 Dissertation seminar (1-3), taken two semesters for minimum of 1 pt each
HUDK 8901 Dissertation Advisement (0), taken after completion of HUDK 7502 and until registration for TI 8900
TI 8900 PhD Dissertation defense

Breadth/Foundation Courses (12 points):
Please note: Courses used to fill Breadth/Foundation course requirements may not be used to fulfill requirements in another area.

One course (minimum of 3 points) in each of the 4 following areas:

1. Biological Basis of Behavior:
   - BBS 5068-5069 Brain and behavior I and II (combined for 3 points)
   - BBSN 4000 Cognitive Neuroscience
   - BBSN 5033 Human clinical neuropsychology
   - MSTC 5000 Neurocognitive models of information processing

2. Cognitive Basis of Behavior:
   - HUDK 4015 Psychology of thinking
   - HUDK 5025 Spatial thinking
   - HUDK 5090 Psychology of language and reading
   - HBSK 5096 Psychology of memory

3. Social Cultural Factors and Individual Differences:
   - HUDK 5125 Cross-cultural psychology
   - HUDK 5029 Personality development and socialization across the lifespan
   - HUDK 5040 Development and psychopathology: atypical contexts and populations
   - HUDK 5121 Children’s Social and Emotional Development in Context
   - HBSK 5031 Family as a context for child development
   - ORLJ 5106 Psychological aspects of organizations
   - ORLJ 5540 Pro-seminar in social and organizational psychology
   - CCXP 5034 Child psychopathology
   - ORLJ 5017 Small group intervention: theory and method

4. Measurement:
   - HUDM 5059 Psychological measurement (3)

Non-departmental Courses (minimum of 8 points):
At least 3 courses outside the department selected in consultation with an advisor.

Additional Requirements:
Two approved papers: an empirical study and an integrative research literature survey*
Successful performance on the Certification Examination
Approved program plan*
Approved dissertation
* Copies of the approved empirical paper, theoretical paper, and program plan must be filed in the department office in 453 Grace Dodge Hall.

**Areas of Focus:**

**Area of focus in Cognition and Learning:**
The area of focus in Cognition and Learning is designed for students interested in theories of human cognition and learning, and experimental approaches to learning, memory, language, reasoning, and problem solving.

**Area of focus in Intelligent Technologies:**
The Intelligent Technologies area of focus offers a program of study for students whose interests include developing cognitive science-based theoretical frameworks for informing the design of educational technology, as well as for students wishing to create educational applications that serve as testbeds for such theoretical frameworks.

By offering this area of focus, the Program in Cognitive Science recognizes the importance of computational and allied technologies to both guide and be guided by cognitive research.

**Area of focus in Learning Analytics:**
In this focus, students will learn key LA/EDM methodologies in technical detail, and how to apply them to real-world problems. Students will learn how to use LA and EDM algorithms and tools appropriately and effectively, and about relevant policy, legal, and ethical issues involved in conducting analytics on educational data. Studies will be integrated with understanding of key theories of cognition and education, preparing students to apply learning analytics methods to make a difference in education. The skills students learn will prepare them for a range of 21st-century jobs, including working for educational technology companies and startups, educational think-tanks, and in data groups at city and state departments of education. Coursework will involve real-world data in a range of educational domains and applications, while integrating world-class offerings in cognition, educational theory, and statistics and measurement. If you have any questions, please contact Professor Gary Natriello or Dr. Charles Lang.

**Area of focus in Reading Research:**
This area of focus prepares students to do basic research in reading, research and theory on all aspects of the psychology of reading (e.g. basic skills, comprehension and aesthetic response) in order to improve educational practice. Students address the connections between written and oral language, and between reading and writing skills. Individual differences are also addressed, especially with respect to students with learning disabilities, adult literacy, learning from text and educational policy issues.

**Area of focus in Cognitive Science of Educational Practice:**
This area of focus is for students interested in understanding and facilitating the thinking and learning involved in educational activities. Students will learn about cognitive processes involved in both formal and informal education and how they are influenced by various factors, including classroom structure, teacher belief systems, student motivation, and educational policy. The program’s focus on
understanding cognitive processes and development is designed to help prospective and practicing teachers, and other educators, improve educational practice. To learn more about this area of focus, please contact Professor Herbert Ginsburg.

**M.Phil. Degree**
The M.Phil. is an *en passant* degree awarded to those nearing the completion of the Ph.D. degree. The student contacts the Office of Doctoral Studies to file for award of the degree.

To receive the M.Phil., the student must satisfactorily complete the following requirements:
1. file an approved “Program Plan of Study” with the Office of Doctoral Studies*
2. complete at least six courses with evaluative grades under Teachers College registration
3. pass the Certification Examination (i.e., Research Methods Examination)
4. complete an approved empirical research paper*
5. complete an approved theoretical research paper*
6. complete all 75 points of coursework required for the degree.

*Copies of the “Program Plan of Study” and both research papers must be given to the Department of Human Development for inclusion in the student’s records.

**Transfer Credit**
Relevant courses with earned grades of B or higher taken in other recognized graduate schools to a maximum of 30 points if completed in another Faculty of Columbia University, may be accepted toward the minimum point requirement for the Ph.D. degree.

To request transfer credit, the student files a “Request for an Allocation of Graduate Credit” with the Office of Admission. Once the Admission Office determines the eligibility of courses for transfer, final determination of transfer credit is awarded at the discretion of the faculty advisor after evaluation of the courses for content and relevance to program requirements. The Office of Admission notifies the student of the results.

**Satisfactory Progress**
Students are expected to make satisfactory progress toward the completion of degree requirements. If satisfactory progress is not maintained, a student may be dismissed from the program. Program faculty annually reviews each student’s progress. Where there are concerns about satisfactory progress, students will be informed by the program faculty. If a student is performing below expectations, remedial work within an appropriate timeline may be required. If satisfactory progress is not maintained, a student may be dismissed from the program.