

**KELLY S. MIX**

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University of Maryland  
College Park, MD 20742

**EMAIL:** kmix@umd.edu

**PHONE:** (301) 405-1632 (lab)  
(517) 881-7830 (cell)

**EDUCATION:** Ph.D., Developmental Psychology, 1995, University of Chicago,  
Chicago, IL  
Dissertation: "Preschoolers' Recognition of Cardinal Equivalence"

M.A., Developmental Psychology, 1993, University of Chicago,  
Chicago, IL

B.A., Elementary Education, 1987, Western Michigan University,  
Kalamazoo, MI  
Senior Honors Thesis: "Learning Styles and Underachievement in  
Gifted Children"

**EMPLOYMENT:** Department of Human Development and Quantitative Methodology  
College of Education  
University of Maryland  
College Park, MD  
Department Chairperson, 2016 - 2021  
Professor, 2016 – present

Department of Counseling, Educational Psychology, and Special  
Education  
College of Education  
Michigan State University  
East Lansing, MI  
Professor, 2010-2016  
Associate Professor, 2005-2010

Department of Psychology  
Indiana University  
Bloomington, IN  
Associate Professor, 2003-2005  
Assistant Professor, 1996-2003

Livermore Valley Unified School District  
Livermore, CA  
Elementary Teacher, 1987-1990

## HONORS

Irving B. Harris Fellow, University of Chicago, 1991-1995.  
Boyd McCandless Award (American Psychological Association, Division 7, Early Career Award), 2002.

## MAJOR RESEARCH GRANTS, AWARDS, AND FELLOWSHIPS:

*Applied Spatial Training for Elementary Mathematics*, \$1,700,000, Institute of Education Sciences, 2022-2026 (Role: Lead PI; Co-PI is Susan Levine, Univ. of Chicago).

*Place Value as a System of Mappings*, \$1,800,000, National Science Foundation, 2016-2021 (Role: Lead PI, Collaborative Research Project with Linda Smith, Indiana University)

*Is Spatial Ability a Malleable Factor for Math Learning?*, \$1,500,000, Institute of Education Sciences, 2012-17, (Role: Lead PI; Co-PI was Susan Levine, Univ. of Chicago).

*Support for Teachers' Implementation of the Common Core State Standards for Mathematics*, \$700,000, Bill and Melinda Gates Foundation, 2013-16, (Role: Co-PI; Lead PI was William Schmidt, MSU).

*Making Sense of Concrete Models for Mathematics*, \$1,340,000, Institute of Education Sciences, 2008-2012, (Role: Lead PI; Co-PI was Linda Smith, Indiana Univ.)

*Key Transitions in Preschoolers' Number and Arithmetic Development: The Psychological Foundations of Early Childhood Mathematics Education*, \$460,050, Spencer Foundation, 2003-2008 (Role: Co-PI; Lead PI was Arthur Baroody, University of Illinois).

*Early Number Development: A Domain General Approach*, \$277,000, National Institutes of Health (NICHD), 1999-2004 (Role: Sole PI).

## SMALL GRANTS, AWARDS, AND FELLOWSHIPS:

*Structure Mapping in Elementary Teaching*, \$374,896, Spencer Foundation, under review, (Role: Lead PI; Co-PI is D. Gentner, Northwestern Univ.).

*Assessing the Effects of Math Talk Quality from 0-3 Years*, \$198,521, Heising-Simons Foundation, 2021-2023 (Role: Lead PI; Co-PI is N. Cabrera, Univ. of Maryland)

*The Influence of Low-Income Mothers' and Fathers' Math Talk on Their Children's Early Math Development*, \$142,916, National

Institutes of Health (NICHD), 2018-2021, (Role: Co-PI; Lead PIs were N. Cabrera, Univ. of Maryland and S. Reich, UC Irvine).

*The Influence of Low-Income Fathers' and Mothers' Math Talk on Their Children's Development*, \$50,000, Spencer Foundation, 2018-19. (Role: Co-PI; Lead PI was N. Cabrera).

*Advancing Family Math Fluency*, \$15,000, McCormick Foundation, 2017, (Role: Co-PI; Lead PI was A. Bradley of the Hatcher Group and Co-PI was S. Levine, University of Chicago).

**GRANT  
CONSULTANT/ADVISORY  
BOARD MEMBER:**

*Early Learning STEM Montana*, pending, National Science Foundation (Christine Lux, PI).

*Exploring the roles of pattern and spatial skills in early mathematics development*, \$937,582. Institute of Education Sciences, 2016-2019 (Bethany Rittle-Johnson, Vanderbilt University, PI).

*Refining and Validating a Number Sense Screener to Identify Young Children at Risk for Mathematical Difficulties in School*, \$1,598,792. Institute of Education Sciences, 2015-2018 (Nancy Jordan, University of Delaware, and Alice Klein, Univ. of California-Berkeley, PIs).

*The Origins of Numerical Concepts from Nonverbal Perception*, \$1,200,000. National Science Foundation, 2015-2019 (Jessica Cantlon, University of Rochester, PI).

*How Proportional Reasoning Relates to Whole Number Operations and Numerical Estimation in Elementary School Children*, \$1,138,000, National Science Foundation, 2014-16 (Ty Boyer, Georgia Southern Univ., PI).

**NATIONAL SERVICE:**

Member, Editorial Board, *Review of Educational Research*, 2021-present.

Member, Finance Committee, Society for Research in Child Development, 2020-2023.

Associate Editor, *Journal of Cognition and Development*, Cognitive Development Society, 2016-2021.

Member, NAEP 2025 Development Panel, National Assessment Governing Board, 2018-19.

Member, NAEP 2025 Visioning Panel, National Assessment Governing Board, 2018.

Editor, Special Issue: Found in Translation, *Journal of Cognition and Development*, 2018.

Standing Member, US Department of Education Institute of Education Member, Sciences (IES), Basic Processes I Grant Panel, 2009-12; 2014-17.

Standing Member, National Science Foundation, Developmental and Learning Sciences Grant Panel, 2013-2016. (Ad hoc reviewer, 2017)

Consultant, Save the Children Network, 2017.

Conference Co-Organizer/Chair (with Susan Levine and Nora Newcombe), *Space and Mathematics: What's the Connection?* Conference Sponsored by the Spatial Intelligence Learning Center (SILC), University of Chicago, November 17-18, 2015

Member, National Science Foundation, Workshop on the Synthesis of Science of Learning, (David Lightfoot, George Washington University, Chair), February 5-6, 2015.

Treasurer, Cognitive Development Society, 2010-2014.

Member, Editorial Board, *Journal of Cognition and Development*, 2008-2016.

Section Co-Chair (with Julie Booth), AERA Program Committee (Div C, Section 3, Mathematics), Vancouver, 2012.

Adhoc Grant Reviewer: NICHD, NSF, US Department of Education, Institute of Education Sciences (IES), 1999-present.

Adhoc Conference Reviewer: AERA, ICIS, SRCD, SREE, 2002-present.

Editorial Consultant, *British Journal of Developmental Psychology*, 2003-2008.

Member, APA-SRCD Task Force on the Role of Psychology in Math and Science Education, Washington, D.C., 2007-08

Co-organizer (with Susan Levine and Nora Newcombe) and presenter, *The art of science: A festschrift in honor of Janellen Huttenlocher*, University of Chicago, 2005.

Chairperson, Boyd McCandless Award Committee, APA Division 7, 2003.

Member, Forum on Using Scientific Knowledge of Development to Inform Preschool Assessment, Temple University, 2003.

Member, NSF Blue Ribbon Panel, Transitions from Childhood to the Workforce, 2000.

Member, Program Committee, Annual Meeting of the Midwestern Psychological Association, 2000-2002.

Adhoc Journal Reviewer: *Animal Learning and Behavior*, *British Journal of Developmental Psychology*, *Child Development*, *Cognition*, *Cognitive Development*, *Cognitive Psychology*, *Cognitive Science*, *Developmental Psychology*, *Developmental Science*, *Early Childhood Research Quarterly*, *Early Education and Development*, *Infancy*, *Journal of Cognition and Development*, *Journal of Experimental Child Psychology*, *Journal of Experimental Psychology: General*, *Journal for Research in Mathematics Education*, *Learning and Individual Differences*, *Psychological Bulletin*, *Psychological Review*, *Psychological Science*, *Psychonomic Bulletin and Review*, *Science*, *Trends in Cognitive Science*.

**UNIVERSITY AND  
DEPARTMENTAL  
SERVICE:**

Chair, HDQM Diversity & Inclusion Committee, 2020-2022  
Recording Secretary, HDQM Assembly, 2021-2022  
Department Chairperson, Department of Human Development and  
Quantitative Methodology, UMD, 2016-2021.  
Committee Chairperson, Search Committee, Chair of Counseling, Higher  
Education, and Special Education (CHSE) Department, 2017-18.  
Program Director, Educational Psychology and Educational Technology,  
MSU, 2013-2015  
Committee Chairperson, College of Education, Reappointment,  
Promotion and Tenure Committee, MSU, 2015.  
Member, Math Education Search Committee, MSU, 2011-12.  
Member, College Faculty Advisory Committee, MSU, 2009-2011.  
Member, CEPSE Personnel Committee, MSU, 2010.  
Member, College Curriculum Committee, MSU, 2007-2009  
Chair, Early Childhood Search Committee, MSU, 2005-07  
Member, CEPSE Faculty Advisory Committee, MSU, 2005-07.  
Elected member, Bloomington Faculty Council, IU, 2001-05.  
Member, Indiana University Fringe Benefits Committee, IU, 2001-04.  
Member, Developmental Cognitive Neuroscience Search Committee, IU,  
2001-03.  
Area Spokesperson, IU, 2002-03.  
Member, POSTCOM, (departmental chairperson's advisory panel),  
Department of Psychology, Indiana University, 1999-2002.  
Member, Graduate Admissions Committee, Department of Psychology,  
Indiana University, 1997-2004.  
Member, Minority Students Committee, Department of Psychology,  
Indiana University, 1997-99.  
Member, Clinical Search Committee, Department of Psychology, Indiana  
University, 1997-98.  
Faculty Mentor, Exploration of Careers in Science Program, NSF (at  
Indiana University), Summer, 1997.  
Faculty Mentor, Developmental Training Grant Minority Research  
Fellowship, Indiana University, Summer, 1997.

**PROFESSIONAL  
AFFILIATIONS:**

Member, Society for Research in Child Development  
(SRCD), American Educational Research Association (AERA), American  
Psychological Association (APA), National Council of Teachers of  
Mathematics (NCTM), Cognitive Development Society (CDS), Society for  
Research in Educational Effectiveness (SREE).

## PUBLICATIONS

### AUTHORED BOOKS

Mix, K. S., Huttenlocher, J., & Levine, S. C. (2002). *Quantitative development in infancy and early childhood*. New York: Oxford University Press.

### EDITED BOOKS

Mix, K. S., Smith, L.B., & Gasser, M. (2010). *The spatial foundations of language and cognition*. New York: Oxford University Press.

Mix, K. S. & Battista, M. (2018) *Spatial Visualization in Mathematics*. Springer.

### BOOK CHAPTERS

1. Baroody, A. J., Lai, M.-L., & Mix, K. S. (2005). The development of young children's number and operation sense and its implications for early childhood education. In B. Spodek & O. Saracho (Eds.) *Handbook of Research on the Education of Young Children*. (pp. 187-221). Mahwah, NJ: Lawrence Erlbaum Associates.

2. Mix, K. S., Sandhofer, C.M., & Baroody, A. J. (2005). Number words and number concepts: The interplay of verbal and nonverbal processes in early quantitative development. In R. V. Kail (Ed.) *Advances in Child Development and Behavior, Volume 33* (pp. 305-346). New York: Elsevier.

3. Mix, K. S. & Sandhofer, C. M. (2007). Do we need a number sense? In M. J. Roberts (Ed.). *Integrating the mind* (pp. 293-326). Hove, UK: Psychology Press.

4. Mix, K. S. (2010). Spatial tools for mathematical thought. In K. S. Mix, L.B. Smith & M. Gasser (Eds.) *The Spatial Foundations of Language and Cognition*, New York: Oxford University Press.

5. Mix, K. S. (2010). Early childhood numeracy. In: Tremblay RE, Barr RG, Peters RDeV, Boivin M, (Eds.) *Encyclopedia on Early Childhood Development* [online]. Montreal, Quebec: Centre of Excellence for Early Childhood Development; 2010:1-6. Available at: <http://www.child-encyclopedia.com/documents/MixANGxp.pdf>.

6. Mix, K. S. & Cheng, Y. L. (2012). The relation between space and math: Developmental and educational implications. In J. B. Benson (Ed.) *Advances in Child Development and Behavior, Volume 42* (pp. 197-243). New York: Elsevier.

7. Mix, K. S., Levine, S. C., & Newcombe, N. S. (2016). Development of quantitative thinking across correlated dimensions. In A. Henik (Ed.) *Continuous Issues in Numerical Cognition: How Many or How Much* (pp. 1-33). New York: Elsevier.

8. Congdon, E., Levine, S. C., Vasileyva, M., & Mix, K. S. (2018). From intuitive spatial measurement to understanding of units. In K.S. Mix & M. Battista (Eds.) *Spatial Visualization in Mathematics* (pp. 25-46). Cham, Switzerland: Springer.

9. Johnson, D., Ginet, L., & Mix, K.S. (2018). The role of adult and environmental input in children's math learning. In J.S. McCray, J.Q. Chen, & J. Eisen and B. Sorkin (Eds.) *Growing Mathematical Minds* (pp. 27-54). Routledge.
10. Mix K.S. & Levine S.C. (2018) Part II Commentary 2: Disparities and Opportunities: Plotting a New Course for Research on Spatial Visualization and Mathematics. In K.S. Mix & M. Battista (Eds.) *Visualizing Mathematics: Research in Mathematics Education* (pp.347-353). Cham, Switzerland: Springer.
11. Young, C.J., Levine, S. C., & Mix, K. S. (2018). The connections between spatial skill and mathematics ability across development. In H.-C. Nuerk, K. Cipora, F. Domahs & M. Haman (Eds.) *On the Development of Space-Number Relations: Linguistic and Cognitive Determinants, Influences, and Associations* (pp. 122-128). Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88963-588-7
12. Young, C.J., Levine, S. C., & Mix, K. S. (2018). What processes underlie the relation between spatial skill and mathematics? In K.S. Mix & M. Battista (Eds.) *Spatial Visualization in Mathematics* (pp. 117-148). Cham, Switzerland: Springer.
13. Mix, K. S., Smith, L. B. & Crespo, S. (2019) Leveraging relational learning mechanisms to improve place value instruction. In M. W. Alibali & E. A. Norton (Eds.) *Constructing Number: Merging Perspectives from Psychology and Mathematics Education* (pp.87-121). Cham, Switzerland: Springer.
14. Mix, K. S. (2022). The cognitive foundations of early childhood numeracy. In A. Betts & K. P. Thai (Eds.) *Innovative Approaches to Early Childhood Development and School Readiness* (pp. 317-348). IGI Global Publishing.
15. Hawes, Z. C. K., Gilligan-Lee, K. A., & Mix, K. S. (in press). Infusing spatial thinking into middle school mathematics: What, why and how? In K.M. Robinson, D. Kostopoulos, & A. Dubé (Eds.), *Mathematical learning and cognition in middle childhood and early adolescence: Integrating interdisciplinary research into practice*. Springer Nature Publishing

## JOURNAL ARTICLES, COMMENTARIES, AND PROCEEDINGS

1. Barsalou, L.W., Yeh, W., Luka, B., Olseth, K., Mix, K. S., & Wu, L. (1993). Concepts and meaning. In K. Beals, G. Cooke, D. Kathman, K. E. McCullough, S. Kita, & D. Testen (Eds.) *Linguistic Society 29: Papers from a parasession on conceptual representations*. University of Chicago: Chicago Linguistics Society.
2. Mix, K. S., Huttenlocher, J., & Levine, S. C. (1996). Do preschool children recognize auditory-visual numerical correspondences? *Child Development*, 67, 1592-1608. doi: 10.1111/j.1467-8624.1996.tb01816.x
3. Mix, K. S., Levine, S. C., & Huttenlocher, J. (1997). Numerical abstraction by infants: Another look. *Developmental Psychology*, 33, 423-428. doi: 10.1037/0012-1649.33.3.423
4. Mix, K. S. (1998). Development of numerical equivalence judgments: Appearances count. In B. Kokinov, D. Gentner, and K. Holyoak, (Eds.), *Proceedings of the Advances in Analogy Research Workshop :Integration of Theory and Data from the Cognitive, Computational, and Neural Sciences*. New Bulgarian University: AMBR Analogy Research Group.
5. Clearfield, M. W. & Mix, K. S. (1999). Number versus contour length in infants' discrimination of small visual sets. *Psychological Science*, 10, 408-411. doi: 10.1111/1467-9280.00177

6. Mix, K. S. (1999). Preschoolers' recognition of numerical equivalence: Sequential sets. *Journal of Experimental Child Psychology*, 74, 309-332 (Special Issue: The Development of Mathematical Cognition, J. Bisanz, Ed.) doi: 10.1006/jecp.1999.2533
7. Mix, K. S. (1999). Similarity and numerical equivalence: Appearances count. *Cognitive Development*, 14, 269-297. doi: 10.1016/S0885-2014(99)00005-2
8. Mix, K. S., Levine, S. C., & Huttenlocher, J. (1999). Early fraction calculation ability. *Developmental Psychology*, 35, 164-174. doi: 10.1037/0012-1649.35.1.164
9. Drake, P. D., Mix, K. S., & Clearfield, M.W. (2000). Precursors to number: Making the most of continuous amount. In L. R. Gleitman & A. K. Joshi (Eds.) *Proceedings of the Twenty-Second Annual Conference of the Cognitive Science Society*. Mahwah, N.J.: Erlbaum.
10. Clearfield, M., & Mix, K.S. (2001). Amount versus number: Infants' use of area and contour length to discriminate small sets. *Journal of Cognition and Development*, 2(3), 243-260. doi: 10.1207/S15327647JCD0203\_1
11. Mix, K. S. (2002). The construction of number concepts. *Cognitive Development*, 17, (Special issue: Constructivism Today, J. Langer & E. Turiel, Eds.), 1345-1363. doi: 10.1016/S0885-2014(02)00123-5
12. Mix, K. S. (2002). Trying to build on shifting sand: Commentary on Cohen and Marks. *Developmental Science*, 5, 205-206. doi: 10.1111/1467-7687.00221\_2
13. Mix, K. S., Huttenlocher, J., & Levine, S. C. (2002). Multiple cues for quantification in infancy: Is number one of them? *Psychological Bulletin*, 128, 278-294.
14. Paik, J. H., & Mix, K. S. (2003). US and Korean children's comprehension of fraction names: A re-examination of cross-national differences, *Child Development*, 74(1), 144-154. doi: 10.1111/1467-8624.t01-1-00526
15. Paik, J. H. & Mix, K. S. (2006). Preschoolers' use of surface similarity in object comparisons: Taking context into account. *Journal of Experimental Child Psychology*, 95(3), 194-214. doi: 10.1016/j.jecp.2006.06.002
16. Mix, K. S. (2008). Getting developmental: A commentary on Rips, Bloomfield & Asmuth, *Behavioral and Brain Sciences*, 31, 662.
17. Mix, K. S. (2008). Surface similarity and label knowledge impact early numerical comparisons, *British Journal of Developmental Psychology*, 26, 13-32. doi: 10.1348/026151007X189109
18. Mix, K.S. (2008). Children's equivalence judgments: Cross-mapping effects. *Cognitive Development*, 23, 191-203. doi: 10.1016/j.cogdev.2007.03.001
19. Mix, K. S. & Paik, J. H. (2008). Do Korean fraction names promote part-whole reasoning? *Journal of Cognition and Development*, 9(2), 145-170. doi: 10.1080/15248370802022605
20. Paik, J. H. & Mix, K. S. (2008). It's all relative: Different levels of relational similarity used in children's comparisons, *British Journal of Developmental Psychology*, 26, 495-505. doi:10.1348/026151007X260163



21. Mix, K. S. (2009). How Spencer made number: First uses of the number words. *Journal of Experimental Child Psychology*, 102, 427-444. doi: 10.1016/j.jecp.2008.11.003
22. Newcombe, N. S., Ambady, N., Eccles, J., Gomez, L., Klahr, D. Linn, M., Miller, K. F., & Mix, K. S. (2009). Psychology's role in mathematics and science education. *The American Psychologist*. 64, 538-550. doi: 10.1037/a0014813
23. Mix, K. S., Moore, J. A., & Holcomb, E. (2011). One-to-one toys promote numerical equivalence concepts, *Journal of Cognition and Development*, 12(4), 463-480. doi: abs/10.1080/15248372.2011.554928
24. Mix, K. S., Sandhofer, C. M., Moore, J., & Russell, C. (2012). Acquisition of the cardinal word principle: The role of input, *Early Childhood Research Quarterly*, 27(2), 274-283. doi: 10.1016/j.ecresq.2011.10.003
25. Cook, E. & Mix, K. (2012). Comparing rich and sparse manipulatives in narrative comprehension in second graders. *Red Cedar Undergraduate Research: Michigan State University*, 3, 34-40.
26. Cheng, Y.L. & Mix, K. S. (2014). Spatial training improves children's mathematics ability. *Journal of Cognition and Development*, 15(1), 2-11 (published online in Oct., 2013). doi: 10.1080/15248372.2012.725186
27. Byrge, L. Smith, L.B., & Mix, K.S. (2014). Beginnings of place value: How preschoolers write three-digit numbers. *Child Development*, 85(2), 437-443. doi:10.1111/cdev.12162.
28. Mix, K. S., Prather, R. W., Smith, L. B., & Stockton, J. D. (2014). Young children's interpretations of multi-digit number names: From emerging competence to mastery. *Child Development*, 85(3), 1306-1319. doi: 10.1111/cdev.12197
29. Newcombe, N., Levine, S.C. & Mix, K.S. (2015/11). Thinking about quantity: The intertwined development of spatial and numerical cognition. *WIREs Cognitive Science*, 6(6), 491-505. doi: 10.1002/wcs.1369
30. Mix, K. S., Levine, S. C., Cheng, Y., Young, C., Hambrick, D. Z., Ping, R. & Konstantopolous, S. (2016). Separate but correlated: The latent structure of space and mathematics across development. *Journal of Experimental Psychology: General*, 145(9), 1206-1227. doi: 10.1037/xge0000182
31. Mix, K. S., Smith, L. B., Stockton, J. D., Cheng, Y.L., & Barterian, J. A. (2016). Grounding the symbols for place value: Evidence from training and long-term exposure to base-10 models. *Journal of Cognition and Development*, 18(1), 129-151. doi: 10.1080/15248372.2016.1180296
32. Mix, K. S., Newcombe, N. S. & Levine, S. C. (2017). Commentary on Leibovich et al.: What next? *Brain and Behavioral Sciences*, 40(1), e180. doi: 10.1017/S0140525X16002181
33. Mix, K. S., Levine, S. C., Cheng, Y.-L., Young, C. J., Hambrick, D. Z., & Konstantopoulos, S. (2017). The latent structure of spatial skills and mathematics: Further evidence from Wave 2. *Journal of Cognition and Development*, 18(4), 465-492. doi: 10.1080/15248372.2017.1346658

34. Young, C. J., Levine, S. C., & Mix, K. S. (2018) The connection between spatial and mathematical ability across development. In H.-C. Nuerk, K. Cipora, F. Domahs, & M. Haman (Eds.) Special Issue: On the Development of Space-Number Relations: Linguistic and Cognitive Determinants, Influences, and Associations. *Frontiers in Psychology*, 9(1). doi.: 10.3389/fpsyg.2018.00755
35. Mix, K. S., Hambrick, D. Z., Satyam, V. R., Burgoyne, A., & Levine, S. C. (2018). The latent structure of spatial skill: A test of the 2x2 typology. *Cognition*, 268-278. doi: 10.1016/j.cognition.2018.07.012
36. Mix, K. S. (2019). Why are spatial skill and mathematics related? *Child Development Perspectives*, 13(2), 121-126. doi: 10.1111/cdep.12323
37. Mix, K.S. & Kalish, C. K. (2019) Foreword to the Special Issue: Found in Translation. *Journal of Cognition and Development*, 20(2), 107-109, doi:10.1080/15248372.2019.1605997.
38. Yuan, L., Prather, R., Mix, K. S., & Smith, L.B. (2019) Preschoolers and multi-digit numbers: A path to mathematics through symbols themselves. *Cognition*, 189(1), 89-104. doi: 10.1016/j.cognition.2019.03.013
39. Yuan, L., Prather, R., Mix, K. S., & Smith, L. B. (2020). Number representations drive number-line estimations. *Child Development*, 91 (4), e952-e967.
40. Mix, K. S., Levine, S. C., Cheng, Y.-L. Stockton, J. D., & Bower, C. (2021). Effects of spatial training on mathematics in first and sixth grade children. *Journal of Educational Psychology*, 113(2), 304-314.
41. Yuan, L., Prather, R., Mix, K. S., & Smith, L. B. (2021) The first step to learning place value: A role for physical models? *Frontiers in Education (Special Issue)*, 14, [doi.org/10.3389/feduc.2021.683424](https://doi.org/10.3389/feduc.2021.683424).
42. Hawes, Z. C., Gilligan-Lee, K. A., & Mix, K. S. (2022). Effects of spatial training on mathematics performance? A Meta-analysis. *Developmental Psychology*, 58(1), 112-137.
43. Johnson, T., Burgoyne, A. P., Mix, K. S., Young, C. J. & Levine, S. C., (2022). Spatial and mathematics skills: Similarities and differences related to age, SES, and gender. *Cognition*, 218, 104918.
44. Mix, K. S., Bower, C., Hancock, G.R., Yuan, L., & Smith, L. B. (2022). The development of place value concepts: Principles after approximation. *Child Development*, 13724.
45. Bower, C., Smith, L. B., Yuan, L. & Mix, K. S. (2022). A network analysis of children's emerging place value concepts. *Psychological Science*, 1-16.
46. Baroody, A. J., Lai, M., & Mix, K. S. (in press). The development and assessment of counting-based cardinal-number concepts. *Educational Studies in Mathematics*.
47. Mix, K. S., Bower, C., Yuan, L., & Smith, L. B. (revision under review). Predictive relations between place value understanding and multidigit calculation. *Educational Psychology*.
48. Baroody, A. J., Lai, M., & Mix, K. S. (revision under review). The development and assessment of early cardinal-number concepts. *Early Childhood Research Quarterly*.

49. Mix, K. S., Smith, L. B., Crespo, S., Bower, C., & Hancock, G.R., (under review). A relational learning intervention for kindergarten place value concepts. *Journal of Research in Mathematics Education*.
50. Cheng, Y.-L. & Mix, K. S. (under revision). Correlation strength mediates the effects of spatial training on mathematics performance.
51. Yuan, L., Byrge, L., Mix, K. S., & Smith, L. B. (in preparation). Learning before school: Individual differences in what preschoolers know about multi-digit numbers.
52. Bower, C., Mix, K. S., & Smith, L. B. (in preparation). *Kindergarteners' mastery of unit differentiation predicts place value understanding and calculation skill in second grade*.
53. Mix, K. S., Alonso, A., Cabrera, N., Lee, J.-J., & Hancock, G. R. (in preparation). *Quantity and quality of parental math talk during toddlerhood*.

### **OUTREACH & POLICY PUBLICATIONS**

1. Burgoyne, A., Johnson, T., Mix, K. S., Young, C. J., & Levine, S. C. (2021). Individual differences in spatial and mathematics skills: Implications for educational and clinical psychology. *Clinical Psychiatry*, 7(6), 110.
2. Gilligan-Lee, K., Hawes, Z. & Mix, K. S. (2022). Spatial cognition: The forgotten piece in mathematics curricula. *Nature Partner Journals: Science of Learning*, 7(1), 1-4.
3. Mix, K. S., Gilligan-Lee, K., & Hawes, Z. (under review). Spatial warm-ups for mathematics! *Mathematics Teacher: Learning and Teaching Pre-K-12*.
4. Mix, K. S., Hurt, M., Crespo, S & Smith, L. B. (in preparation). How teachers can harness relational learning to improve place value instruction.
5. Mix, K. S., Gentner, D., & Simms, N. (in preparation). The vast untapped potential of Structure Mapping Theory in the K-12 classroom.

### **INVITED COLLOQUIA**

University of Michigan  
 University of Iowa  
 Indiana University  
 Universite de Provence  
 Boston University  
 University of Illinois  
 Michigan State University  
 University of Chicago  
 Ready at Five, Baltimore MD  
 Erikson Institute/Center for Early Childhood Research  
 Carnegie Mellon University  
 Temple University  
 Grand Valley State University  
 University of Maryland  
 Towson University/Maryland State Department of Education

University of Delaware  
Boston College  
Kent State University  
University College London  
Birkbeck University of London

#### **TEACHER PROFESSIONAL DEVELOPMENT**

Pontiac Public Schools, Pontiac, Michigan  
Wyoming Public Schools, Wyoming, Michigan  
Eaton Rapids Public Schools, Eaton Rapids, Michigan  
The Chelsea School, College Park, Maryland  
Center for Young Children, College Park, Maryland

#### **KEYNOTE OR PLENARY PRESENTATIONS**

Mix, K. S., & Smith, L. B. (2015, October). *Acquiring the place value system: Statistical learning, concrete models, and the power of symbols*. Invited address presented at the biennial meeting of the Cognitive Development Society, Columbus, OH.

Mix, K. S. (2019, March). *What does cognitive science have to say to teachers?* Invited address to the Society for Research on Child Development, Baltimore, MD.

Mix, K. S. (2019, November). *Cognition and early childhood numeracy: How number concepts are built and why input matters*. Plenary session presented at the Promising Math conference, Erickson Institute, Chicago, IL.

#### **CONFERENCE PRESENTATIONS (2017-2022)**

47. Baroody, A. J., Lai, M.-L., & Mix, K. S. (2017, April). *Assessing early cardinal number concepts*. Paper presented at the annual meeting of the American Educational Research Association, San Antonio, TX.

48. Baroody, A. J., Lai, M.-L., & Mix, K. S. (2017, October). *Assessing early cardinal number concepts*. Poster presented at the annual meeting of the International Group for the Psychology of Mathematics Education (North American Chapter), Indianapolis, IN.

49. Cheng, Y.-L., Mix, K. S., Reckase, M. D., Levine, S. C., & Freer, D. (2017, October). *The dimensionality between visual-spatial working memory and calculation ability*. Poster presented at the biennial meeting of the Cognitive Development Society, Portland, OR.

50. Mix, K. S., Levine, S. C., & Cheng, Y.-L. (2017, October). *Effects of spatial training on elementary mathematics*, in N. Jordan and C. Barbieri (Chairs) symposium, Usable knowledge for improving mathematics learning: Bridging research in cognition and development with educational practice in diverse contexts, presented at the biennial meeting of the Cognitive Development Society, Portland, OR.

51. Mix, K. S., Levine, S. C., Cheng, Y.-L., Young, C. J., & Rinne, L. (2018, April). *The latent structure of spatial skill and mathematics*. In E. Zippert (Chair) symposium, More than just numbers: Varied predictors of mathematical knowledge, presented at the annual meeting of the American Educational Research Association, New York, NY.

52. Mix, K.S. (2019, March). *External representations in mathematics education*. In P. Sidney (Chair) symposium, External representations in mathematical thinking and learning, presented at the biennial meeting of the Society for Research in Child Development, Baltimore, MD.
53. Mix, K.S., Levine, S.C., Burgoyne, A., Johnson, T., & Young, C. J. (2019, June). *The relation between spatial skill and mathematics: Individual differences*. In R. Merkley's (Chair) symposium, Beyond number sense: Exploring the contribution of domain-general cognitive processes to the development of mathematical thinking, presented at the annual meeting of the Mathematical Cognition and Learning Society, Ottawa, Canada.
54. Hennigar, A., Cabrera, N., Chen, Y., & Mix, K. S. (2019, October). *Low-income mothers' and fathers' math talk during parent-child play: A look at quantity and quality*. Poster presented at the biennial meeting of the Cognitive Development Society, Louisville, KY.
55. Mix, K. S., Levine, S. C., Burgoyne, A., Johnson, T., & Young, C. J. (2019, October). *Sex and SES differences in spatial skills and mathematics*. In B. Rittle-Johnson's (Chair) symposium *Understanding individual differences in mathematics knowledge*, presented at the biennial meeting of the Cognitive Development Society, Louisville, KY.
56. Yuan, L., Smith, L. B., & Mix, K. S. (2019, October). *Learning numbers as a system of symbols and their relations*. In D. Kim's (Chair) symposium, The symbol grounding problem in numerical cognition: Insights from developmental psychology, presented at the biennial meeting of the Cognitive Development Society, Louisville, KY.
57. Hennigar, A., Cabrera, N. & Mix, K. S. (2019, November). *A look at low-income mothers and fathers' math talk during play*. Paper presented at the Promising Math meeting hosted by the Erikson Institute, Chicago, IL.
58. Mix, K. S., Bower, C., Yuan, L. & Smith, L. B. (2020, June). *Longitudinal associations between place value and calculation skill*. In K. S. Mix & R. S. Siegler (Chairs) symposium, Understanding Multidigit Number Meanings, accepted for presentation at the annual meeting of the Mathematical Cognition and Learning Society, Dublin, Ireland. (Meeting held online due to COVID-19.)
59. Hawes, Z., Gilligan, K., & Mix, K. S. (2020, June). *Can mathematics performance be improved through spatial training? A meta-analysis*. Poster accepted for presentation at the annual meeting of the Mathematical Cognition and Learning Society, Dublin, Ireland. (Meeting held online due to COVID-19.)
60. Hennigar, A., Cabrera, N., & Mix, K. S., (2020, July). *The Quantity and Quality of Mothers' and Fathers' Math Talk: A Longitudinal Exploration*. Poster accepted for presentation at the biennial meeting of the International Congress of Infant Studies, Glasgow, Scotland. (Meeting held online due to COVID-19.)
61. Gilligan, K. A., Hawes, Z., & Mix, K. S. (2020, September). *Can mathematics be improved through spatial training? A Meta-Analysis*. In W. Moring and A. Ribner's (Chairs) symposium, Unpacking the association between spatial and mathematical thinking: investigations about directional and causal effects, presented at the annual meeting of the Mathematics Cognition and Learning Society meeting. (Meeting held online due to COVID-19.)
62. Alonso, A., Chen, Y., Cabrera, N., & Mix, K. S. (2021, April). "Uno, dos, tres!" Latino mothers' and fathers' math talk with their toddlers." Poster presented at the biennial meeting of the Society for Research in Child Development. (Meeting held online due to COVID-19.)

63. Bower, C., Mix, K. S., & Smith, L. B. (2021, April). *Kindergarteners' mastery of the base-10 representational system predicts place value understanding and later calculation skills in second grade*. In Giulia Boriello's (Chair) symposium, *Beyond accuracy: Children's correct and incorrect strategies on early STEM tasks provide insights into cognitive development*, presented at the biennial meeting of the Society for Research in Child Development. (Meeting held online due to COVID-19.)

64. Yuan, L., Prather, R., Mix, K. S., & Smith, L. B. (2021, April). *When and how physical models benefit the learning of symbolic multi-digit numbers*. In E.L. Zippert's (Chair) symposium, *Examining the roles of patterning knowledge, spatial assembly and analogic reasoning in early mathematics development*, presented at the biennial meeting of the Society for Research in Child Development. (Meeting held online due to COVID-19.)

#### **COURSES TAUGHT**

Michigan State University Cognitive Development, Socio-Cultural Development, Proseminar in Educational Psychology, Reflections on Learning (Intro to Ed Psych), Qualitative Research Methods, Learner Commonalities and Learner Differences.

Indiana University Introduction to Developmental Psychology, Developmental Psychology Laboratory Course, Topical seminars on (a) Mathematical Development, (b) Themes in Developmental Research and (c) Ontogeny and Phylogeny.