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Bethany Rittle-Johnson
Professor and Chair, Psychology and Human Development
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AREA OF SPECIALIZATION

My broad interests concern how people learn and how to improve their learning. My research focuses on learning of key concepts and problem-solving procedures within mathematics, with an emphasis on experiences that promote learning. I conduct this research in both laboratory and classroom contexts to better understand learning processes.

EDUCATION

1999 *Ph.D., Developmental Psychology*, Carnegie Mellon University, Pittsburgh, Pa.
1996 *M.S., Developmental Psychology*, Carnegie Mellon University, Pittsburgh, Pa.
1994 *B.A., Psychology* (with Distinction), Biology minor, University of Virginia

PROFESSIONAL EXPERIENCE

January 2019 – June 2021	Department Chair, Psychology & Human Devel.
February 2019 -	Anita S. and Antonio M. Gotto Chair in Child Devel
Fall 2016 –	Professor, Vanderbilt University
Spring 2018	Visiting Scholar, University of Tokyo Graduate School of Education
Fall 2013 - Spring 2017	Developmental Sciences Program Head
Fall 2010 – Spring 2015	Associate Professor, Vanderbilt University
Fall 2002 – Spring 2010	Assistant Professor, Vanderbilt University
Summer 1999 – Summer 2002	Post-Doctoral Research Associate

Pittsburgh Advanced Cognitive Tutor (PACT) Center
Human-Computer Interaction Institute
Carnegie Mellon University

HONORS AND AFFILIATIONS

Anita S. and Antonio M. Gotto Chair in Child Development, Vanderbilt University

Excellence in Research Award, 2010-2011, Vanderbilt University, Peabody College.
NCTM (National Council of Teachers of Mathematics) Linking Research and Practice Outstanding Publication Award, 2011 for article "Comparison helps students learn to be better estimators" in *Teaching Children Mathematics*.
German-USA Early Career Research Exchange for Research on Learning Technologies and Technology-Supported Education, National Science Foundation, 2001-2002
NIMH/NRSA Post-Doctoral Training Grant, National Institutes of Mental Health, 2000 2001
Graduate Fellowship (for tuition and stipend), National Science Foundation, 1995-1998
Graduate Research Scholarship in Psychology, American Psychological Foundation, 1998
Affiliations: Kennedy Center
Member: Association for Psychological Science, Society for Research in Child Development, Cognitive Development Society, American Educational Research Association, National Council of Teachers of Mathematics.

PUBLICATIONS

BOOK CHAPTERS

Rittle-Johnson, B., Star, J., Durkin, K. & Loehr, A. (2019). Compare and discuss to promote deep learning. Manalo, E. (Ed.). *Deeper Learning, Dialogic Learning, and Critical Thinking: Research-Based Strategies for the Classroom.* New York, NY. Routledge.

Rittle-Johnson, B. (2019). Iterative development of conceptual and procedural knowledge in mathematics learning and instruction. Dunlosky, J. & Rawson, K. (Eds). *Cambridge University Handbook on Cognition and Education*. (pp. 124-147). Cambridge, UK. Cambridge University Press.

Schneider, M., Thompson, C. A., Rittle-Johnson, B. (2018). Associations of magnitude comparison and number line estimation with mathematical competence: A

comparative review. In Lemaire, P. (Ed.) *Cognitive Development from a Strategy Perspective: A Festschrift for Robert S. Siegler*. (pp. 100 - 119). Stroud, U.K.: Out of House Publishing.

Rittle-Johnson, B. & Loehr, A. (2017). Instruction based on self-explanation. In R. Mayer & P. Alexander (Eds.) *Handbook of Research on Learning and Instruction.* Second edition. (pp. 349 - 365). New York, NY: Routledge.

Rittle-Johnson, B., Star, J. R., & Durkin, K. (2017). The power of comparison in mathematics instruction: Experimental evidence from classrooms. In D. C. Geary, D. B. Berch, & K. M. Koepke (Eds.), *Mathematical Cognition and Learning* (Vol. 3). (pp. 273-296). Waltham, MA: Elsevier.

Rittle-Johnson, B., and Jordan, N. C. (2016). Synthesis of IES-Funded Research on Mathematics: 2002–2013 (NCER 2016-2003) Washington, DC: National Center for Education Research, Institute of Education Sciences, U.S. Department of Education. This report is available on the Institute website at ies.ed.gov/ncer/pubs/20162003/

Star, J. & Rittle-Johnson, B. (2015). Toward an educational psychology of mathematics education. In L. Corno & E. Anderman (Eds.) *Handbook of Educational Psychology*. Third edition. (pp. 257-268). American Psychological Association. New York, NY: Routledge.

Rittle-Johnson, B. & Schneider, M. (2014). Developing conceptual and procedural knowledge of mathematics. In R. Kadosh & A. Dowker (Eds), *Oxford Handbook of Numerical Cognition*. Oxford Press. DOI 10.1093/oxfordhb/ 9780199642342.013.014

Rittle-Johnson, B., & Star, J. R. (2011). The power of comparison in learning and instruction: Learning outcomes supported by different types of comparisons. In J. P. Mestre & B. H. Ross (Ed.), *Psychology of Learning and Motivation*: *Cognition in Education (Vol. 55)*. (pp. 199-222). Waltham, MA: Elsevier. DOI 10.1016/B978-0-12-387691-1.00007-7.

Rittle-Johnson, B. & Siegler, R.S. (1998). The relation between conceptual and procedural knowledge in learning mathematics: A review. In C. Donlan (Ed.), *The development of mathematical skill* (pp. 75-110). Hove, UK: Psychology Press.

ARTICLES IN REFEREED JOURNALS

*student (graduate or undergraduate); ^post-doc

Loehr, A.* Fazio, L. & Rittle-Johnson, B. (in press). The role of recalling previous errors in middle-school children's learning. *British Journal of Educational Psychology.* https://doi.org/10.1111/bjep.12341

Rittle-Johnson, B, Farran, D. & Durkin, K. (in press). Instructional strategies in urban middle-school mathematics classrooms: Students' perspectives. *Journal of Experimental Education.*

Zippert, E.^, Douglas, A.,* & Rittle-Johnson, B. (2020 Preschoolers' broad mathematics experiences with parents during play. *Journal of Experimental Child Psychology,* 192, doi: 10.1016/j.jecp.2019.104757

Douglas, A.*, Zippert, E.^, & Rittle-Johnson, B. (2019) Parent-Child Talk about Early Numeracy: The Role of Context and Parents' Math Beliefs. *Iris Journal of Scholarship, 1,* 48-68. https://doi.org/10.15695/iris.v1i0.4659

Fyfe, E.*, Rittle-Johnson, B., & Farran, D. (2019). Predicting success on high-stakes math tests from preschool math measures among children from low-income homes. *Journal of Educational Psychology. 111*(3), 402-413. dx.doi.org/10.1037/edu0000298

Rittle-Johnson, B, Zippert, E. L. ^, Boice, K. L.* (2019). The Roles of Patterning and Spatial Skills in Early Mathematics Development. *Early Childhood Research Quarterly, 46,* pp. 166-178. DOI 10.1016/j.ecresq.2018.03.006

Zippert, E.,^ Clayback, K.* & Rittle-Johnson, B. (2019). Not Just IQ: Patterning Predicts Preschoolers' Math Knowledge Beyond Fluid Reasoning. *Journal of Cognition and Development, 20,* 752-771. *doi: 10.1080/15248372.2019.1658587*

Zippert, E. ^ & Rittle-Johnson, B. (2019). The home math environment: More than numeracy. *Early Childhood Research Quarterly*. *50*, pp. 4-15. DOI 10.1016/j.ecresq.2018.07.009

Rittle-Johnson, B, Zippert, E. L. ^, Boice, K. L.* (2018). Data on preschool children's math, patterning, and spatial knowledge. *Data in Brief, 20,* pp. 196-199. DOI 10.1016/j.dib.2018.07.061

Gresalfi, M., Rittle-Johnson, B., Loehr, A.* & Nichols, I.* (2018). Design matters: Explorations of Content and Design in Fraction Games. *Educational Technology Research and Development, 66,* 579–596. DOI: 10.1007/s11423-017-9557-7.

Chu, J.,* Rittle-Johnson, B., & Fyfe, E.* (2017). Diagrams benefit symbolic problem solving. *British Journal of Educational Psychology, 87*, 273-287. DOI: 10.1111/bjep.12149.

Durkin, K., Rittle-Johnson, B., & Star, J. (2017). Using comparison of multiple strategies in the mathematics classroom: Lessons learned and next steps. *ZDM Mathematics Education*, *49*, 585-598. DOI 10.1007/s11858-017-0853-9.

Fyfe, E.* & Rittle-Johnson, B. (2017). Mathematics practice without feedback: A desirable difficulty in a classroom setting. *Instructional Science, 45*, 177-184. 10.1007/s11251-016-9401-1.

Loehr, A.* & Rittle-Johnson, B. (2017). Putting the "th" in tenths: Providing place value labels helps reveal the structure of our base-10 numeral system. *Journal of Cognition and Development, 81*, 226 - 245. DOI: 10.1080/15248372.2016.1243118

Rittle-Johnson, B. (2017). Developing mathematics knowledge. *Child Development Perspectives, 11,* 184-190. DOI: 10.1111/cdep.12229

Rittle-Johnson, B. Fyfe, E.,* Hofer, K. & Farran, D. (2017). Early Math Trajectories: Low-Income Children's Mathematics Knowledge from Age 4 to 11. *Child Development, 88,* 1727-1742. DOI: 10.1111/cdev.12662.

Rittle-Johnson, B., & Loehr, A.* (2017). Eliciting Explanations: Constraints on when self-explanation aids learning. *Psychonomic Bulletin & Review, 24*, 1501-1510. DOI 10.3758/s13423-016-1079-5.

Rittle-Johnson, B., Loehr* A., & Durkin, K. (2017). Promoting self-explanation to improve mathematics learning: A meta-analysis and instructional design principles. *ZDM Mathematics Education, 49*, 599-611. DOI 10.1007/s11858-017-0834-z.

Rittle-Johnson, B. Fyfe, E.,* & Loehr, A.* (2016). The Content of Instruction Within A Mathematics Lesson: Implications for Conceptual and Procedural Knowledge Development. *British Journal of Educational Psychology, 86,* 576 - 591. DOI:10.1111/bjep.12124

Star, J.R., Rittle-Johnson, B., & Durkin, K. (2016). Comparison and explanation of multiple strategies: One example of a small step forward for improving

mathematics education. *Policy Insights from the Behavioral and Brain Sciences, 3*(2), 151-159. doi: 10.1177/2372732216655543.

Fyfe, E. R.* & Rittle-Johnson, B. (2016). The benefits of computer-generated feedback for mathematics problem solving. *Journal of Experimental Child Psychology,* 147, 140-151. doi: 10.1016/j.jecp.2016.03.009.

Fyfe, E. R.* & Rittle-Johnson, B. (2016). Feedback both helps and hinders learning: The causal role of prior knowledge. *Journal of Educational Psychology,* 108(1), 82 – 97. doi: 10.1037/edu0000053

Miller, M.R. ^ , Rittle-Johnson, B., Loehr, A. M.* & Fyfe, E. R.* (2016). The influence of relational knowledge and executive function on preschoolers' repeating pattern knowledge. *Journal of Cognition and Development. 17*, 85-104, DOI 10.1080/15248372.2015.1023307

DeCaro, D., DeCaro, M.S.^, & Rittle-Johnson, B. (2015). Achievement motivation and knowledge development during exploratory learning. *Learning and Individual Differences, 37,* pp. 15-26. DOI 10.1016/j.lindif.2014.10.015.

Fyfe, E. R.*, DeCaro, M. S.^ & Rittle-Johnson, B. (2015).When feedback is cognitively-demaning: The importance of working memory capacity. *Instructional Science,* 43, pp. 73 – 91. 10.1007/s11251-014-9323-8.

Fyfe, E. R.*, McNeil, N. M. & Rittle-Johnson, B (2015). Easy as ABCABC: Abstract language facilitates performance on a concrete patterning task. *Child Development*. DOI 10.1111/cdev.12331

Rittle-Johnson, B., Fyfe, E. R.* Loehr, A. M.* & Miller, M.R. ^ (2015). Beyond numeracy in preschool: Adding patterns to the equation. *Early Childhood Research Quarterly, 31,* pp. 101-112. DOI 10.1016/j.ecresq.2015.01.005

Rittle-Johnson, B. Schneider, M. & Star, J. (2015). Not a one-way street: Bi-directional relations between procedural and conceptual knowledge of mathematics. *Educational Psychology Review, 27,* pp. 587-597. DOI 10.1007/s10648-015-9302-x

Star, J.R., Newton, K., Pollack, C.,* Kokka, K.*, Rittle-Johnson, B., & Durkin, K.^ (2015). Student, teacher, and instructional characteristics related to students' gains in flexibility. *Contemporary Educational Psychology, 41,* pp. 198-208. DOI 10.1016/j.cedpsych.2015.03.001

Durkin, K.* & Rittle-Johnson, B. (2014). Diagnosing misconceptions: Revealing changing decimal fraction knowledge. *Learning and Instruction*. DOI 10.1016/j.learninstruc.2014.08.003

Fyfe, E. R.*, DeCaro, M. S.^ & Rittle-Johnson, B. (2014). An alternative time for telling: When conceptual instruction prior to exploration improves mathematical knowledge. *British Journal of Educational Psychology, 84*, pp. 502-519. doi: 10.1111/bjep.12035

Loehr, A. M.,* Fyfe, E. R.*, & Rittle-Johnson, B. (2014). Wait for it… Delaying instruction improves mathematics problem solving: A classroom study. *The Journal of Problem Solving*, *7*, pp. 36 – 49. Doi: 10.7771/1932-6246.1166

Star, J.R., Pollack, C.*, Durkin, K.*, Rittle-Johnson, B., Lynch, K.*, Newton, K., & Gogolen, C.* (2014) Learning from comparison in algebra. *Contemporary Educational Psychology.* DOI 10.1016/j.cedpsych.2014.05.005

Adams, D.*, McLaren, B. M., Durkin, K., Mayer, R.E., Rittle-Johnson, B., Isotani, S., & Van Velsen, M. (2014). Using erroneous examples to improve mathematics learning with a web-based tutoring system. *Computers in Human Behavior, 36*, pp. 401-411. DOI 10.1016/j.chb.2014.03.053.

McEldoon, K.*, Durkin, K.*, & Rittle-Johnson, B. (2013). Is self-explanation worth the time? A comparison to additional practice. *British Journal of Educational Psychology.* 83(4), pp. 615-632. DOI: 10.1111/j.2044-8279.2012.02083.x

Rittle-Johnson, B., Fyfe, E. R.*, McLean, L. E.*, McEldoon, K. L.*, (2013). Emerging understanding of patterning in four-year-olds. *Journal of Cognition and Development*. 14(3), pp. 375-395. DOI: 10.1080/15248372.2012.689897

DeCaro, M. S.^ & Rittle-Johnson, B. (2012). Solving math problems prepares students to learn from instruction. *Journal of Experimental Child Psychology.* 113(4), pp. 552-568. doi 10.1016/j.jecp.2012.06.009

Durkin, K.* & Rittle-Johnson, B. (2012). The effectiveness of using incorrect examples to support learning about decimal magnitude. *Learning and Instruction*, 22(3), pp. 206-214. doi:10.1016/j.learninstruc.2011.11.001

Fyfe, E. R.*, Rittle-Johnson, B. & DeCaro, M. S.^ (2012). The effects of feedback during exploratory mathematics problem solving: Prior knowledge matters. *Journal of Educational Psychology*, 104(4), pp. 1094-1108. doi: 10.1037/a0028389

Matthews, P. G.*, Rittle-Johnson, B., McEldoon, K.* & Taylor, R. S.^ (2012). Measure for measure: What combining diverse measures reveals about children's understanding of the equal sign as an indicator of mathematical equality. *Journal for Research in Mathematics Education*, *43*(3), p. 316-350.

Rittle-Johnson, B., Star, J., & Durkin, K.* (2012). Developing procedural flexibility: Are novices prepared to learn from comparing procedures? *British Journal of Educational Psychology*. 82, 436-455. DOI:10.1111/j.2044-8279.2011.02037.x.

Schneider, M., Rittle-Johnson, B., & Star, J. (2011). Relations between conceptual knowledge, procedural knowledge, and procedural flexibility in two samples differing in prior knowledge. *Developmental Psychology*. 47(6), 1525–1538. doi: 10.1037/a0024997

Rittle-Johnson, B., Matthews, P.G.*, Taylor, R.^ & McEldoon, K.* (2011). Assessing Knowledge of Mathematical Equivalence: A Construct Modeling Approach. *Journal of Educational Psychology*, 103 (1), 85-104. DOI: 10.1037/a0021334

McNeil, N. M., Rittle-Johnson, B., Hattikudur, S.* & Peterson, L. A.* (2010). Continuity in representation between children and adults: Arithmetic knowledge hinders undergraduates' algebraic problem solving. *Journal of Cognition and Development, 11(4),* 437-457.

Star, J. R. Kenyon, M.*, Joiner, R.* & Rittle-Johnson, B. (2010). Comparing pays off! *Mathematics Teacher, 103 (8)*, 608 – 612.

Star, J. R., Kenyon, M.*, Joiner, R.* & Rittle-Johnson, B. (2010). Comparison helps students learn to be better estimators. *Teaching Children Mathematics, 16(9),* 557-559.

Matthews, P. G.* & Rittle-Johnson, B. (2009). In pursuit of knowledge: Comparing self-explanations, concepts, and procedures as pedagogical tools. *Journal of Experimental Child Psychology*, *104*, 1-21.

Rittle-Johnson, B. & Koedinger, K.R. (2009). Iterating between lessons on concepts and procedures can improve mathematics knowledge. *British Journal of Educational Psychology*, *79*, 483 – 500.

Rittle-Johnson, B. & Star, J. (2009). Compared to what? The effects of different comparisons on conceptual knowledge and procedural flexibility for equation solving. *Journal of Educational Psychology, 101(3)*, 529-544.

Rittle-Johnson, B., Star, J. & Durkin, K.* (2009). The importance of prior knowledge when comparing examples: Influences on conceptual and procedural knowledge of equation solving. *Journal of Educational Psychology*, *101 (4)*, 836-852. DOI: 10.1037/a0016026

Star, J. R. & Rittle-Johnson, B. (2009). It pays to compare: An experimental study on computational estimation. *Journal of Experimental Child Psychology, 101*, 408-426.

Star, J. R., & Rittle-Johnson, B. (2009). Making algebra work: Instructional strategies that deepen student understanding, within and between algebraic representations. *ERS Spectrum*, *27* (2), 11-18.

Star, J. R., Rittle-Johnson, B., Lynch, K.* & Perova, N.* (2009). The role of prior knowledge in the development of strategy flexibility: The case of computational estimation. *ZDM – The International Journal on Mathematics Education*, *41*, 569-579.

Rittle-Johnson, B. & Kmicikewycz, A. O.* (2008). When generating answers benefits arithmetic skill: The importance of prior knowledge. *Journal of Experimental Child Psychology*, *101*, 75-81.

Rittle-Johnson, B, Saylor, M. & Swygart, K.* (2008). Learning from explaining: Does it matter if mom is listening? *Journal of Experimental Child Psychology*, *100*(3), 215-224.

Star, J. & Rittle-Johnson, B. (2008). Flexibility in problem solving: The case of equation solving. *Learning and Instruction*, *18*, 565-579.

Rittle-Johnson, B. & Star, J. (2007). Does comparing solution methods facilitate conceptual and procedural knowledge? An experimental study on learning to solve equations. *Journal of Educational Psychology*. *99*(3), 561-574.

Rittle-Johnson, B. (2006). Promoting transfer: Effects of self-explanation and direct instruction. *Child Development, 7(1),* 1-15.

Rittle-Johnson, B. & Koedinger, K.R. (2005). Designing knowledge scaffolds to support mathematical problem solving. *Cognition and Instruction*, *23*(3), 313-349.

Rittle-Johnson, B., Siegler, R.S. & Alibali, M.W. (2001). Developing conceptual understanding and procedural skill in mathematics: An iterative process. *Journal of Educational Psychology, 93,* 346-362.

Rittle-Johnson, B. & Alibali, M.W. (1999). Conceptual and procedural knowledge of mathematics: Does one lead to the other? *Journal of Educational Psychology*, *91*, 1-16.

Rittle-Johnson, B. & Siegler, R.S. (1999). Learning to spell: Variability, choice, and change in children's strategy use. *Child Development, 70,* 332-348.

MANUSCRIPTS UNDER REVIEW

Douglas, A.* & Rittle-Johnson, B. (under review). Parents, preschoolers, and card games: Promoting parent-child math exploration and positive parental math beliefs.

Loehr, A.* Rittle-Johnson, B., Durkin, K. & Star, J. R. (under review). Does calling it 'Morgan's way' reduce student learning? Evaluating the effect of person-presentation of worked-examples in mathematics classrooms.

McMullen, J., Star, J., & Rittle-Johnson, B. (under review). Individual differences in procedural and conceptual knowledge predict future learning.

Rittle-Johnson, B., Star, J. R., & Durkin, K. (under review). How can cognitive science research help improve education? The case of comparing multiple strategies to improve mathematics learning and teaching. Invited submission to *Current Directions in Psychological Science.*

Zippert, E.^, Douglas, A.,* & Rittle-Johnson, B. (under review). Finding patterns in objects and numbers: Patterning in pre-K predicts kindergarten mathematics knowledge.

CONFERENCE PROCEEDINGS (Peer Reviewed)

Rittle-Johnson, B. Star, J., Durkin, K. & Loehr, A. (2018, May). Comparing solution strategies to promote algebra learning and flexibility. In Hsieh, F. & Kaur, B. (Eds) *Proceedings of the 8th ICMI-East Asia Regional Conference on Mathematics Education*, Volume 1. Taipei, Taiwan: National Taiwan Normal University.

Fyfe, E. R.,* & Rittle-Johnson, B. (2016, November). Longitudinal predictions of sixth-grade geometry knowledge. In Wood, M.B. et al (Eds), *Proceedings of the 38th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. Tucson, AR: University of Arizona.

Hong, M. K.*, Yeo, D. J.*, Rittle-Johnson, B., Fazio, L. K. (2016, August). Are There Hidden Costs to Teaching with Incorrect Examples? In Grodner, D. et al. (Eds.), *Proceedings of 38th Annual Meeting of the Cognitive Science Society*. Austin, TX: Cognitive Science Society.

Loehr, A.*, & Rittle-Johnson, B. (2016, August). Putting the "th" in Tenths: The Role of Labeling Decimals in Revealing Place Value Structure. In Grodner, D. et al. (Eds.), *Proceedings of 38th Annual Meeting of the Cognitive Science Society*. Austin, TX: Cognitive Science Society.

Chu, J.*, Fyfe, E.* & Rittle-Johnson, B. (2015, July). Diagrams benefit symbolic problem solving. In Noelle, D. C., Dale, R., Warlaumont, A. S., Yoshimi, J., Matlock, T., Jennings, C. D., & Maglio, P. P. (Eds.), *Proceedings of 37th Annual Meeting of the Cognitive Science Society*. (pp. 381-386). Austin, TX: Cognitive Science Society.

DeCaro, D., DeCaro, M.S., & Rittle-Johnson, B. (2013, August). Achievement Motivation and Strategy Selection during Exploratory Learning. In M. Knauff, M. Pauen, N. Sebanz, & I. Wachsmuth (Eds.), *Proceedings of 35th Annual Meeting of the Cognitive Science Society. (*pp. 370-375). Austin, TX: Cognitive Science Society.

Fyfe, E. R., & Rittle-Johnson, B. (2012, August). The effects of feedback during exploration depend on prior knowledge. In N. Miyake, D. Peebles, & R. P. Cooper (Eds.), *Proceedings of the 34th Annual Conference of the Cognitive Science Society* (pp. 348-354). Sapporo, Japan: Cognitive Science Society.

Isotani, S., Adams, D, Mayer, R. E., Durkin, K., Rittle-Johnson, B., and McLaren, B. (2011). Can erroneous examples help middle-school students learn decimals? *Proceedings of the European Conference on Technology Enhanced Learning.*

McEldoon, K. & Rittle-Johnson, B. (2010, October). Assessing Elementary Students' Functional Thinking Skills: The Case of Function Tables. *Proceedings of the 2010 annual meeting of the North American Chapters of the International Group for the Psychology of Mathematics Education*. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education.

Rittle-Johnson, B., Matthews, P., Taylor, R. & McEldoon, K. (2010, October). Assessing Knowledge of Mathematical Equivalence: A Construct Modeling Approach. *Proceedings of the 2010 annual meeting of the North American Chapters of the International Group for the Psychology of Mathematics Education*. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education.

DeCaro, M. & Rittle-Johnson, B. (2010, August). The Capacity to Discover: Working Memory and the Ability to Use Self-Explanation to Discover Early Algebra Concepts. In S. Ohlsson & R. Catrambone (Eds.) *Cognition in Flux: Proceedings of the 32nd Annual Meeting of the Cognitive Science Society* (p. 536). Austin, TX: Cognitive Science Society.

Durkin, K., Rittle-Johnson, B. & Star, J. R. (2010, August). Immediate Introduction to Multiple Procedures Supports Procedural Flexibility in Equation Solving. In S. Ohlsson & R. Catrambone (Eds.) *Cognition in Flux: Proceedings of the 32nd Annual Meeting of the Cognitive Science Society* (p. 638). Austin, TX: Cognitive Science Society.

McEldoon, K., Cochrane-Braswell, Caroline, & Rittle-Johnson, B. (2010, August). Effects of Problem Context on Strategy Use within Functional Thinking. In S. Ohlsson & R. Catrambone (Eds.) *Cognition in Flux: Proceedings of the 32nd Annual Meeting of the Cognitive Science Society* (pp. 145-149). Austin, TX: Cognitive Science Society.

Star, J. & Rittle-Johnson, B. (2009, September). The role of prior knowledge in the development of strategy flexibility: The case of computational estimation. *Proceedings of the 2009 annual meeting of the North American Chapters of the International Group for the Psychology of Mathematics Education*. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education.

Rittle-Johnson, B. & Star, J. (2007, August). Compared to what? How different types of comparison facilitate transfer in mathematics. Part of the symposium "Fostering transfer of knowledge in education settings." In D. S. McNamara & G. Trafton (Eds.), *Proceedings of the 29th Meeting of the Cognitive Science Society*. (pp. 21-22). Austin, TX; Cognitive Science Society.

Matthews, P., & Rittle-Johnson, B. (2007, August). To teach by concept or by procedure? Making the most of self-explanations. In D. S. McNamara & G. Trafton (Eds.), *Proceedings of the 29th Meeting of the Cognitive Science Society*. (pp. 1283-1288). Austin, TX; Cognitive Science Society.

Rittle-Johnson, B. (2005, August). Promoting flexible problem-solving: The effects of direct instruction and self-explaining. In K. Forbus, D. Genter & T. Regier (Eds.), *Proceedings of the Twenty-Sixth Annual Conference of the Cognitive Science Society* (pp. 1161-1166). Mahwah, NJ: Erlbaum.

Rittle-Johnson, B. & Koedinger, K. (2002, October). Comparing instructional strategies for integrating conceptual and procedural knowledge. In Mewborn, D.S., Sztajin, P., White, D.Y., Wiegel, H.G., Bryant, R.L. & Nooney, K. (Ed.) *Proceedings of the twenty-fourth annual meeting of the North American Chapters of the International Group for the Psychology of Mathematics Education*. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education, (pp. 969-978)

Rittle-Johnson, B., Kalchman, M., Czarnocha, B., & Baker, W. (2002, October). An integrated approach to the procedural/conceptual debate. In Mewborn, D.S., Sztajin, P., White, D.Y., Wiegel, H.G., Bryant, R.L. & Nooney, K. (Ed.) *Proceedings of the twenty-fourth annual meeting of the North American Chapters of the International Group for the Psychology of Mathematics Education*. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education, (pp. 167-180).

Rittle-Johnson, B. & Koedinger, K. (2001, August). Using cognitive models to guide instructional design: The case of fraction division. In J. Moore & K. Stenning (Ed.), *Proceedings of the 23rd Annual Conference of the Cognitive Science Society,* (pp. 857-862). Mahwah, NJ, Erlbaum.

CURRICULA

Clark, E., Koedinger, K.R. & Rittle-Johnson, B. (2002). *Cognitive Tutor Math 6.* Carnegie Learning Co., Pittsburgh, PA. (Intelligent tutoring component that I authored is now being made available on the web. See https://mathtutor.web.cmu.edu/

INVITED PRESENTATIONS

Invited Colloquium Presentations

2020, March. University of Chicago, Education Workshop series
2019, October. Northwestern University Cognitive Science talk series.
2019, February. University of Virginia, Curry Education Research Lectureship Series
2017, May. University of Delaware, College of Education and Human Development Colloquium

2017, March. Temple University, Temple Institute for Learning and Education Sciences (TILES) seminar series
2014, November. Carnegie Mellon University, Program in Interdisciplinary Education Research
2014, November. University of Louisville, Department of Psychological and Brain Sciences
2013, November. Indiana University, Cognitive Science Colloquium Series

Keynote and Invited Conference Presentations

Rittle-Johnson, B. (2017, October). Do you notice a pattern? Patterning, relational reasoning and mathematics knowledge. Presidential invited symposium. Cognitive Development Society Biennial Meeting, Portland, OR.

Rittle-Johnson, B. (2015, May). The power of comparison in learning and instruction: Experimental evidence from mathematics classrooms. Invited speaker at 2015 Math Cognition Conference, hosted at University of Missouri, St. Louis (with funding from NIH).

Rittle-Johnson, B. (2015, March). The power of comparison in learning and instruction: Experimental evidence from mathematics classrooms. Invited speaker at the 5th Latin American School for Education, Cognitive and Neural Sciences. Organized by the James S. McDonnell Foundation and Pontificia Universidad Católica de Chile.

Rittle-Johnson, B. (2014, October). The power of comparison in learning and instruction: Experimental evidence from mathematics classrooms. Invited speaker at Improving Student Achievement: A Summit on Learning and Education, hosted at Kent State University.

Rittle-Johnson, B. (2013, July). The Value of Problem Exploration: When Struggling to Solve Unfamiliar Problems Prepares Children to Learn from Mathematics Instruction. Keynote talk at the 2013 Midwest Meeting on Mathematical Thinking.

Rittle-Johnson, B. (2012, August). Overcoming Misconceptions: Insights from Research on Understanding the Equal Sign. Keynote talk at the International Conference on Conceptual Change, Trier, Germany.

Rittle-Johnson, B. (2008, November). Mathematical problem solving: Bridging between cognitive science and education. Invited presentation at Problem Solving Workshop, sponsored by Purdue University and U.S. Air Force.

Rittle-Johnson, B. & Star, J. (2008, June). It pays to compare: Effectively using comparison to support student learning of algebra. Invited talk for the Institute for Education Sciences Research Conference, Washington, D.C.

Star, J. & Rittle-Johnson, B. (2007, August). Contrasting cases in mathematics lessons support procedural flexibility. Invited talk presented at the 12th Biennial conference of the European Association for Research on Learning and Instruction (EARLI), Budapest, Hungary.

RESEARCH GRANTS

Co-Principal Investigator, with Kelley Durkin, PI, "A Longitudinal Study Predicting Postsecondary STEM Readiness Among Low-Income Minority Students," EHR Core, National Science Foundation, 08/2018 - 07/2021, $1,499,997.

Co-Principal Investigator, with Maithilee Kunda (PI), "CompCog: Collaborative Research: Learning Visuospatial Reasoning Skills from Experience," National Science Foundation Science of Learning, 8/15/2017 – 7/31/2019, $200,000.

Principal Investigator, "Exploring the roles of pattern and spatial skills in early mathematics development," U.S. Dept. of Education Institute of Education Sciences, 7/1/2016 – 6/30/20, $937,582.

Principal Investigator, Erica Zippert (co-PI), "Putting it all together: Developing a more comprehensive theory of early mathematics development," Heising-Simons Foundation, 8/1/16 – 7/31/19, $134,344.

Principle Investigator with Jon Star (PI, Harvard University) and Kelley Durkin (Investigator), "Collaborative Proposal: Leveraging Comparison and Explanation of Multiple Strategies (CEMS) to Improve Algebra Learning," National Science Foundation EHR Core, 7/1/2016 – 3/30/20, $570,082 (to VU).

Investigator with Dale Farran (PI), Kerry Hofer (co-PI), Bruce McCandliss and Gavin Price "Contributions to Mathematics Competency of At-Risk Students: The Impact of Executive Function, Approximate Number System and Early Mathematics Skills," U.S. Dept. of Education Institute of Education Sciences, 7/2014 – 6/2018. $1,599,382.

Investigator with Dale Farran (PI), Kerry Hofer (co-PI), Bruce McCandliss and Gavin Price "Middle School Mathematics Competencies in At-Risk Students, a

Longitudinal Investigation from Early Childhood," Heising-Simons Foundation, 10/2013 – 9/2015, $625,000.

Principal Investigator, "Which is Correct? Effectiveness of Comparing Correct and Incorrect Solutions for Fraction Learning" Peabody Small Research Grant, 5/2012-4/2013, $6800.

Principal Investigator, "CAREER: Developing conceptual and procedural knowledge: The roles of self- and instructional explanations," National Science Foundation Faculty Early Career Development Program, 7/2008 – 6/2014. $567,000.
*Grant was selected in 2014 by NSF as one of nine REESE-competition grants for a case study because of the exemplary involvement of junior researchers and publication productivity.

Co-Principal Investigator with Jon Star (PI) and Kristie Newton. "Helping teachers to use and students to learn from contrasting examples: A scale-up study in Algebra I" National Science Foundation Research & Evaluation on Education in Science & Engineering (REESE), 10/2008 – 9/ 2014, $1,999,987 ($171, 508 to Vanderbilt).

Co-Principal Investigator with Paul Cobb (PI), Guatam Biswas and Thomas Smith. "Postdoctoral Training: Rigorous Research Methods in the Learning Sciences" U.S. Dept. of Education Institute of Education Sciences, 6/08 – 11/13. $864,447.

Co-Principal Investigator with Jon Star. "Using contrasting examples to support procedural flexibility and conceptual understanding in mathematics" U.S. Dept. of Education Institute of Education Sciences, 8/05 - 8/09. $1,014,175 ($560,566 to Vanderbilt).

Principal Investigator, "Validating measures of conceptual and procedural knowledge of mathematical equivalence" Peabody Small Research Grant, 1/08-12/08, $6900.

Principal Investigator, "Promoting integration of conceptual and procedural knowledge in mathematics: The effects of students inventing procedures and self-explaining" Peabody Small Research Grant, 6/03-5/04. $6850.

CONFERENCE PRESENTATIONS (since 2002)

* student (graduate or undergraduate); ^post-doc

Star, J., Rittle-Johnson, B. & Durkin, K. (2020, June). Teaching for Improved Procedural Flexibility in Mathematics. Paper presented at the International Conference of the Learning Sciences, Nashville, TN.

Douglas, A.*, Zippert, E.^ & Rittle-Johnson (2020, April). The Impact of Information, Context, and Child Gender on Parents' Early Numeracy Input. Paper presented at the American Educational Research Association Annual Conference, San Francisco, CA.

Douglas, A.*, Zippert, E.^ & Rittle-Johnson (2020, April). Measuring Preschoolers' Geometry Knowledge. Poster presented at the American Educational Research Association Annual Conference, San Francisco, CA.

Joseph, N. & Rittle-Johnson, B. (2020, April). Black Girls' Perspectives of Instructional Strategies in Urban Middle-School Mathematics Classrooms. Paper presented at the American Educational Research Association Annual Conference, San Francisco, CA.

Rittle-Johnson, B., Hickendorff, M., Star, J., Durkin, K. & Loehr, A. (2020, April). Comparing and Explaining Examples of Multiple Strategies to Promote Algebra Learning: Instructional Features that Predict Learning. Paper presented at the American Educational Research Association Annual Conference, San Francisco, CA.

Rittle-Johnson, B., Lachowicz, M., Durkin, K. & Farran, D. (2020, April) Early Math Trajectories Predicting Math Knowledge from Ages 11-15: A Longitudinal Investigation with Urban Youth. Poster presented at the American Educational Research Association Annual Conference, San Francisco, CA.

Shero, M.,* Durkin, K., Rittle-Johnson, B., & Star, J. R. (2020, January). Teacher beliefs surrounding comparison in algebra instruction. Poster presented at the Tennessee STEM Education Research Conference, Cookeville, TN.

Rittle-Johnson, B. & Zippert, E.^ (2019, November). It's a pattern! Best practices for promoting young children's patterning knowledge. Poster presented at National Association for the Education of Young Children (NAEYC) 2019 Conference, Nashville, TN.

Loehr, A.*, Rittle-Johnson, B., Durkin, K., Star, J. (2019, October). Does Calling it 'Morgan's Way' Reduce Adoption and Generalization of the Strategy? Paper presented at the Cognitive Development Society meeting. Louisville, KY.

Rittle-Johnson, B., Zippert, E.^ and Douglas, A.* (2019, October). 16 is one more than 15: The role of the successor principle in building mathematics knowledge. Paper presented at the Cognitive Development Society meeting. Louisville, KY.

Zippert, E.,^ Douglas, A.*, & Rittle-Johnson, B. (2019, October). Exploring the Link Between Patterning, Numeracy, and Math Knowledge. Poster to be presented at the biennial meeting of the Cognitive Development Society, Louisville, KY.

Rittle-Johnson, B. (2019, October). Compare and Discuss to deepen learning. Talk presented at the National Council of Teachers of Mathematics Regional Conference, Nashville, TN.

Shiba, S.*, Ota, E*., Fukuda, M.*, Uesaka, Y., & Rittle-Johnson, B. (2019, August). Teachers' diagnosis of students' deep understanding. Paper presented at EARLI 2019, Aachen, Germany.

Douglas, A.*, Zippert, E.^, & Rittle-Johnson, B. (2019, June). Patterns in parents' broad early math support. Poster presented at the annual meeting of the Mathematical Cognition and Learning Society, Ottowa, Canada.

Zippert, E.^, Douglas, A.* & Rittle-Johnson, B. (2019, May). Numbers and patterns and space, oh my! Preschoolers and Parents Explore Math Broadly. Paper presented at the Association for Psychological Science (APS) Annual Conference, Washington, DC.

Loehr, A. M.*, Durkin, K., Rittle-Johnson, B., Star, J. R. (2019, April). Impact of comparison and explanation of multiple strategies on learning and flexibility in algebra. Paper presented at the American Educational Research Association (AERA) annual meeting, Toronto, Canada.

Douglas, A.*, Zippert, E. ^ & Rittle-Johnson, B. (2019, March). Supporting Early Numeracy Development with Card Games: "War" Tops The Deck. Poster presented at the Society for Research in Child Development (SRCD) Conference, Baltimore, MD.

Rittle-Johnson, B., Zippert, E.^ & Douglas, A.* (2019, March). Including Repeating Patterning Skills in Early Mathematics Education Paper presented at the Society for Research in Child Development (SRCD) Conference, Baltimore, MD.

Rittle-Johnson, B. (2019, March). Support for Relational Learning in Japanese Math Textbooks. Paper presented at the Society for Research in Child Development (SRCD) Conference, Baltimore, MD.

Zippert, E. ^ Smith, M.* & Rittle-Johnson, B. (2019, March). Parents' Broad Math Support Concurrently and Longitudinally Predicts Preschoolers' Broad Math Knowledge and Skills. Paper presented at the Society for Research in Child Development (SRCD) Conference, Baltimore, MD.

Zippert, E. ^ Clayback, K.* & Rittle-Johnson, B. (2019, March). More Than Numeracy, Patterning Predicts Early Mathematics. Paper presented at the Society for Research in Child Development (SRCD) Conference, Baltimore, MD.

Zippert, E.^, Douglas, A.*, & Rittle-Johnson, B. (2019, March). Measuring repeating patterning skill in kindergarten. Paper presented at the annual meeting of the Society for Research in Educational Effectiveness, Washington, DC.

Rittle-Johnson, B. & Zippert, E.^ (2018, October). Supporting early math knowledge through patterning. Tennessee Association for Children's Early Education, Jackson, TN. (Professional development for preschool teachers)

Zippert, E. ^ Clayback, K.* & Rittle-Johnson, B. (2018, June). More Than Just IQ: Exploring the Link Between Patterning and Individual Math Skills. Poster presented at the National Research Conference on Early Childhood, Arlington, VA.

Zhang, Y.* Fine, S.*, Loehr, A.* Star, J. & Rittle-Johnson, B. (2018, May). Procedural flexibility for algebra: Assessment development. Poster presented at the 8th East Asia Regional Conference on Mathematics Education. Taipei, Taiwan.

Durkin, K., Loehr, A. M.,* Rittle-Johnson, B., Star, J. (2018, April). Effects of encouraging comparison and explanation of multiple strategies on instructional practices in algebra classrooms. Roundtable presentation at the American Educational Research Association (AERA), New York City, NY

Loehr, A. M.*, Fazio, L. K., Rittle-Johnson, B. (2018, April). Examining the relationship between children's memory for past errors and learning. Poster presented at the American Educational Research Association (AERA), New York City, NY.

Loehr, A. M.*, Rittle-Johnson, B., Star, J. R., & Desharnais, C. (2018, April). Developing a more comprehensive measure of formal algebra knowledge. Poster presented at the American Educational Research Association (AERA), New York City, NY.

Zippert, E. ^ & Rittle-Johnson, B. (2018, April). Examining how pattern, spatial, executive function and language skills contribute to preschoolers' math knowledge. Paper presented at the annual meeting of the American Educational Research Association, New York City, New York.

Zippert, E. ^ & Rittle-Johnson, B. (2018, April). Parental support of preschoolers' number, pattern, and spatial skills predicts concurrent and later math knowledge. Paper presented at the annual meeting of the American Educational Research Association, New York City, New York.

Rittle-Johnson, B., Fyfe, E.* & Zippert, E.^ (2017, August). Patterning Knowledge is Foundational to Mathematics Achievement. Paper presented at the 2017 conference of the European Association for Research on Learning and Instruction (EARLI), Tampere, Finland.

Rittle-Johnson, B., Loehr, A.* & Durkin, K. (2017, August). Self-Explanation Promotes Mathematics Learning: A Meta-Analysis and Its Implications for Education. Paper presented at the 2017 conference of the European Association for Research on Learning and Instruction (EARLI), Tampere, Finland.

Loehr, A.*, Rittle-Johnson, B. & Durkin, K. (2017, April). Promoting Self-Explanation to Improve Mathematics Learning: A Meta-Analysis. Poster presented at the Society for Research in Child Development Conference, Austin, Tx.

Rittle-Johnson, B. & Doydum, A. O.* (2017, April). Spatial skills predict mathematics knowledge in preschool. Paper presented at the National Council of Teachers of Mathematics Research Conference, San Antonio, Tx.

Rittle-Johnson, B. & Fyfe, E. (2017, April). Early Math Skills That Predict Low-Income Children's Mathematics Development from Age 4 to 12. Poster presented at the Society for Research in Child Development Conference, Austin, Tx.

Fyfe, E. R.* & Rittle-Johnson, B. (2016, April). When Feedback Helps versus Hurts: The Impact of Human versus Computer-Generated Feedback on Mathematics Problem Solving. Poster presented at the American Educational Research Association (AERA), Washington, DC.

Gresalfi, M., Rittle-Johnson, B., Loehr, A.* & Nichols, I.* (2016, April). Slicing and Bouncing: Can Implicit Digital Games Support Transfer to Traditional Assessments as Well as Explicit Digital Games? Paper presented at the American Educational Research Association (AERA), Washington, DC.

Rittle-Johnson, B., Fyfe, E. R., Hofer, K. & Farran, D. (2016, April). Early Math Trajectories: From Prekindergarten to Fifth Grade. Poster presented at the American Educational Research Association (AERA), Washington, DC.

Fyfe, E. R., Rittle-Johnson, B., Hofer, K. & Farran, D. (2015, October). Pattern knowledge, but not shape knowledge, predicts fifth-grade math outcomes. Poster presented at the Cognitive Development Society Biennial Meeting, Columbus, Oh.

Rittle-Johnson, B., Fyfe, E. R., Loehr, A. & Miller, M. (2015, October). It's a Pattern! The Importance of Early Pattern Knowledge for Mathematics. Paper presented in the symposium I organized "Early Math Matters: Development of Number, Shape and Pattern Knowledge in Early Childhood" at the Cognitive Development Society Biennial Meeting, Columbus, Oh.

Fyfe, E. R.*, McNeil, N. M. & Rittle-Johnson, B. (2015, March). The impact of abstract versus concrete labels on patterning performance. Poster presented at the Society for Research in Child Development Conference. Philadelphia, Pa.

Fyfe, E. R.* & Rittle-Johnson, B. (2015, March). Feedback both helps and hinders mathematics problem solving. Poster presented at the Society for Research in Child Development Conference. Philadelphia, Pa.

Fyfe, E. R.*, & Rittle-Johnson, B. (2015, March). The Timing of Feedback on Mathematics Problem Solving in a Classroom Setting. Paper presented at the Society for Research on Educational Effectiveness (SREE) Spring 2015 Conference, Washington, DC.

Rittle-Johnson, B., Fyfe, E. R.* & Loehr, A. M.* (2015, March). "Just tell me how to solve it." The impact of including procedural instruction in conjunction with conceptual instruction. Poster presented at the Society for Research in Child Development Conference. Philadelphia, Pa.

Rittle-Johnson, B., Hofer, K. & Farran, D. (2015, March). It's a pattern! The importance of early pattern knowledge for middle school mathematics achievement. Poster

presented at the Society for Research in Child Development Conference. Philadelphia, Pa.

Fyfe, E.*, Rittle-Johnson, B., Loehr, A.*, Miller, M.^ (2014, April). Enhancing the Quality of Children's Explanations to Promote Patterning Knowledge. Paper presented at the annual meeting of the American Educational Research Association (AERA), Philadelphia, PA.

Fyfe, E.*, DeCaro, M.S.^ & Rittle-Johnson, B. (2014, April). The Role of Feedback Type and Working Memory Capacity During Problem Solving. Paper presented at the annual meeting of the American Educational Research Association (AERA), Philadelphia, PA.

Loehr, A.*, Fyfe, E.*, Miller, M.^, & Rittle-Johnson, B. (2014, April). Learning from Explanations: Does It Matter Who Provides Them? Paper presented at the annual meeting of the American Educational Research Association (AERA), Philadelphia, PA.

Loehr, A.*, Rittle-Johnson, B., & Rajendran, A.* (2014, April). Promoting Mathematical Problem Solving and Explanation at Home. Poster presented at the annual meeting of the American Educational Research Association (AERA), Philadelphia, PA.

Rittle-Johnson, B., Fyfe, E.* Loehr, A.* & DeCaro, M.^ (2014, April) Learning from Explanation: The Timing and Source of Explanations for Learning Early Algebra. Paper presented at the annual meeting of the American Educational Research Association (AERA), Philadelphia, PA. Symposium organizer of "Different Perspectives on the Role of Explanation and Exploration in Learning."

Loehr, A.*, Rittle-Johnson, B., & Rajendran, A.*, (2013, October). Promoting mathematical problem solving and explanation at home. Poster presented at the Cognitive Development Society Conference, Memphis, TN.

Miller, M.^, Rittle-Johnson, B., Fyfe, E.*, & Loehr, A.* (2013, October). Importance of executive function for learning about patterns. Poster presented at the Cognitive Development Society Conference, Memphis, TN.

Loehr, A.*, Miller, M.^, DeCaro, M.^ & Rittle-Johnson, B. (2013, May). Semantic Verbal Fluency Predicts Mathematical Learning. Poster presented at the 25th Association for Psychological Science Annual Convention, Washington, DC.

Miller, M.^, Loehr, A.*, Fyfe, E.*, Rittle-Johnson, B., McLean, L.* & McEldoon, K.* (2013, May). Preschoolers' knowledge of repeating patterns over time. Poster presented at the 25th Association for Psychological Science Annual Convention, Washington, DC.

McEldoon, K. L.*, Liu, R.*, Rittle-Johnson, B. (2013, April). Verbal Imprecision in Mathematical Explanations as an Indicator of Learning. Poster presented at The Society for Research in Child Development Conference. Seattle, WA.

McEldoon, K. L.*, & Rittle-Johnson, B. (2013, April). Self-Explanation Improves Mathematics Learning in Low Prior Knowledge Students. Poster presented at The Society for Research in Child Development Conference. Seattle, WA.

Fyfe, E.*, DeCaro, M.^, & Rittle-Johnson, B. (2013, March). An Alternative Time for Telling: When Conceptual Instruction Prior to Exploration Improves Mathematical Knowledge. Paper presented at the Society for Research on Educational Effectiveness (SREE) Spring 2013 Conference, Washington, DC.

McEldoon, K., Cho, S. J., & Rittle-Johnson, B. (2012, September). Measuring Intervention Effectiveness: The Benefits of an Item Response Theory Approach. Paper presented at the Society for Research on Educational Effectiveness (SREE) Fall 2012 Conference, Washington, DC.

Durkin, K., Pollack, C., Star, J. R. & Rittle-Johnson, B. (2012, March). Differences in Fidelity of Implementation Measures: What Videos and Surveys Reveal About Algebra Instruction. Paper presented at the Society for Research on Educational Effectiveness (SREE) Spring 2012 Conference, Washington, DC.

Rittle-Johnson, B., Fyfe, E. R., McLean, L. E., McEldoon, K. L., (April, 2012). Algebra in preschool: Emerging understanding of patterns in four-year-olds. Paper presented at the annual meeting of the American Educational Research Association (AERA), Vancouver, Canada.

DeCaro, M. & Rittle-Johnson, B. (2011, September). Preparing to learn from math instruction: Mastery-oriented students benefit most from exploratory activities. Paper presented at the Society for Research on Educational Effectiveness (SREE) Fall 2011 Conference, Washington, DC.

Fyfe, E., Rittle-Johnson, B., & DeCaro, M. (2011, September). The effects of feedback during exploratory math practice. Paper presented at the Society for Research on Educational Effectiveness (SREE) Fall 2011 Conference, Washington, DC.

Durkin, K., Rittle-Johnson, B. & Star, J. R. (2011, August). Procedural flexibility matters for student achievement: How procedural flexibility relates to other outcomes. Paper presented at the 14th Biennial conference of the European Association for Research on Learning and Instruction, Exeter, United Kingdom.

Durkin, K., & Rittle-Johnson, B. (2011, August). The Effectiveness of Comparing Incorrect and Correct Examples. Paper presented at the 14th biennial meeting of the European Association for Research on Learning and Instruction, Exeter, United Kingdom.

McEldoon, K. L., Durkin, K. L., Rittle-Johnson, B. (2011, July). The Effect of Self-Explanation on Procedural and Conceptual Knowledge. Poster presented at The Cognitive Science Society Conference. Boston, MA.

Star, J. & Rittle-Johnson, B. (2011, May). The Power of Comparison in Learning and Instruction: Experimental Evidence from Mathematics Classrooms. Paper presented at the 2011 Association for Psychological Sciences annual convention, Washington, D.C.

DeCaro, M. & Rittle-Johnson, B. (2011, April). Preparing to Learn from Math Instruction by Solving Problems First. Paper presented at the Biennial meeting of the Society for Research in Child Development, Montreal, QC.

Matthews, P. G., Rittle-Johnson, B., & McEldoon, K. (2011, April). Understanding the equals sign as a gateway to algebraic thinking. Poster presented at the Biennial meeting of the Society for Research in Child Development, Montreal, QC.

McEldoon, K., Durkin, K., & Rittle-Johnson, B. (2011, April). Making the most of instructional time: The benefit of self-explanation. Paper presented at the Biennial meeting of the Society for Research in Child Development, Montreal, QC.

DeCaro, M. & Rittle-Johnson, B. (2011, April). Self-Explanation Prompts are Less Beneficial if Students Know More. Paper presented at the annual meeting of the American Educational Research Association (AERA), New Orleans, LA.

Durkin K., Rittle-Johnson, B. & Star, J.R. (2011, April). Procedural Flexibility Matters for Student Achievement: The Relationship between Procedural Flexibility and Standardized Tests. Presented at the annual meeting of the American Educational Research Association (AERA), New Orleans, LA.

Durkin, K. & Rittle-Johnson, B. & Ramsey, R. (2011, April). Comparing Incorrect and Correct Examples in Algebra Classrooms. Paper presented at the annual meeting of the American Educational Research Association (AERA), New Orleans, LA.

Rittle-Johnson, B., Star, J.R., & Durkin, K. (2010, May). Developing Procedural Flexibility: When Should Multiple Solution Methods Be Introduced? Paper presented in symposium I organized: "Understanding Mathematical Proficiency: New Insights from Cognitive Science," at the annual meeting of the American Educational Research Association (AERA), Denver, CO.

Matthews, P. G., Rittle-Johnson, B., Taylor, R. S., McEldoon, K. (2010, March). Understanding the Equals Sign as a Gateway to Algebraic Thinking. Paper presented at the 2010 Society for Research on Educational Effectiveness (SREE) conference, Washington DC.

Rittle-Johnson, B., Star, J.R., & Durkin, K. (2009, October). Pathways to Flexibility: Leveraging Comparison and Prior Knowledge. Paper presented in symposium I organized "Understanding Knowledge Change: Investigations on How Children Learn Mathematics and Literacy Skills" at the biennial meeting of the Cognitive Development Society, San Antonia, TX.

McEldoon, K. L. & Rittle-Johnson, B. (2009, October). Development of Functional Thinking: Finding rules of correspondence. Poster presented at Cognitive Development Society Conference, El Tropicano Hotel. San Antonio, TX.

Rittle-Johnson, B., Star, J.R., & Durkin, K. (2009, August). Using Comparison to Support Flexibility in Mathematics: The Effects of Different Comparison Types and Prior Knowledge. Paper presented at the 13th Biennial conference of the European Association for Research on Learning and Instruction, Amsterdam, Netherlands.

Rittle-Johnson, B. (2009, August). Discussant and co-organizer of symposium "Acquiring Mathematical Competence: The Roles of Conceptual and Procedural Knowledge." 13th Biennial conference of the European Association for Research on Learning and Instruction, Amsterdam, Netherlands.

Schneider, M., Rittle-Johnson, B., & Star, J.R. (2009, August). Conceptual Knowledge, Procedural Knowledge and Procedural Flexibility in Mathematics: The Need for Valid Measures. Paper presented at the 13th Biennial conference of the European Association for Research on Learning and Instruction, Amsterdam, Netherlands.

Star, J. & Rittle-Johnson, B. (2009, August). The Role of Prior Knowledge in the Development of Strategy Flexibility: The Case of Computational Estimation. Paper presented at the 13th Biennial conference of the European Association for Research on Learning and Instruction, Amsterdam, Netherlands.

Rittle-Johnson, B., Star, J.R., & Durkin, K. (2009, June) Prior Knowledge Matters: An Aptitude x Treatment Interaction When Learning Mathematics from Comparison. Poster presented at the Institute for Education Sciences Research Conference, Washington, D.C.

Durkin, K. & Rittle-Johnson, B. (2009, April). Comparison of correct and incorrect examples when learning decimal fractions. Poster presented at the Biennial meeting of the Society for Research in Child Development, Denver, CO.

Matthews, P. & Rittle-Johnson, B. (2009, April). Dual dimensions for concreteness? Paper presented at the Biennial meeting of the Society for Research in Child Development, Denver, CO.

Rittle-Johnson, B., Matthews, P. G., & Saylor, M. (2009, April). Promoting explanations to support mathematics learning. Paper presented at the Biennial meeting of the Society for Research in Child Development, Denver, CO.

Taylor, R., Rittle-Johnson, B., Matthews, P., & McEldoon, K., (2009, March). Mapping children's understanding of mathematical equivalence. Paper presented at the 2009 Society for Research on Educational Effectiveness conference, Washington DC.

Star, J. R. & Rittle-Johnson, B. (2008, March). The Role of Comparison in the Development of Flexible Knowledge of Computational Estimation. Paper presented at the annual meeting of the American Educational Research Association, New York, New York.

Rittle-Johnson, B. & Star, J.R. (2007, October). When it pays to compare. The benefits of comparison in mathematics classrooms. Paper presented at the biennial meeting of the Cognitive Development Society, Santa Fe, NM.

Star, J.R., Rittle-Johnson, B., Lee, K., Samson, J., & Chang, K. (2007, June). When it pays to compare: Experimental evidence for when and how comparison facilitates mathematics learning. Poster presented at the Institute for Education Sciences Research Conference, Washington, D.C.

Star, J. & Rittle-Johnson, B. (2007, April). Does Comparison Support Transfer of Knowledge? Investigating Student Learning of Algebra. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Star, J., Chang, K.L, & Rittle-Johnson, B. (2007, April) The Benefits of Comparison in Learning to Solve Equations. Poster presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Star, J. Glaser, H. & Rittle-Johnson, B. (2007, April) Investigating student thinking about estimation: What makes a good estimate? Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Matthews, P. & Rittle-Johnson, B. (2007, March). Concepts or Procedures? Optimizing the Use of Self-Explanations to Correct Misconceptions. Paper presented at the Biennial meeting of the Society for Research in Child Development, Atlanta, GA.

Rittle-Johnson, B., Star, J., Glasser, H. & Lee, K. (2006, June). Does using contrasting cases increase problem solving, flexibility and conceptual knowledge? An experimental study on early algebra learning. Poster presented at the Institute of Education Sciences 2006 Research Conference, Washington, D.C.

Rittle-Johnson, B. & Star, J. (2006, April). Explaining contrasting solution procedures supports problem-solving flexibility and transfer. Paper presented at the Symposium I organized titled "How to support explanation in the classroom: The role of teachers and tasks". Annual meeting of the American Educational Research Association, San Francisco, CA.

Rittle-Johnson, B. (2005, October). Contrasting examples in mathematics lessons support flexible and transferable knowledge. Paper presented at the biennial meeting of the Cognitive Development Society, San Diego, CA.

Swygert, K.E., Rittle-Johnson, B. & Saylor, M. (2005, April). Learning from explaining: Does it matter if mom is listening? Poster presented at the Biennial meeting of the Society for Research in Child Development, Atlanta.

Rittle-Johnson B. & McMullen, P. (2004, April). Using real-world contexts during mathematical problem solving. When it helps and when it doesn't. Paper presented in the symposium I organized titled "Finding Balance: Re-visiting the relations

between conceptual and procedural knowledge." Annual meeting of the American Educational Research Association, San Diego, CA.

Rittle-Johnson, B. & McMullen, P. (2003, October). When less is more: Using multiple representations to support learning about algebraic symbols. Poster presented at the bienniel meeting of the Cognitive Development Society, Park City, UT.

TEACHING

Courses Taught at Vanderbilt

Psy 8470 Cognitive Science to the Classroom (PhD seminar)
Psy 1250 Developmental Psychology
Psy 2250 Cognitive Aspects of Development
Psy 2100 How Children Learn Math seminar
Psy 2600 Educational Psychology
Psy 334/Educ 3110 Psychological Foundations of Education
Psy 2980 Directed Research: supervise 4-10 undergraduates in my lab each term

Undergraduate Advising

Advisor for Undergraduate Honors Thesis students Alexander Kmicikewycz (2006), Junyi Chu (2015)
Faculty sponsor for Vanderbilt University Summer Research Program (VUSRP) students: Kathryn Swygart (2004), Adam Porter (2007), Ran Liu (2012), Junyi Chu (2014)
Mentor 4-10 undergraduate research assistants each semester
Freshman advisor, 2003-2004; 2006-2007; 2008-2009; 2013-14; 2014-15
Academic advisor for 6 – 15 undergraduates each year

Doctoral Student Advising

Major Professor for 6 Psychological Sciences students: Percival Matthews (2010 graduate; Associate Professor at University of Wisconsin Madison), Kelley Durkin (2012 graduate; Research Assistant Professor at Vanderbilt University), Katie McEldoon (2014 graduate; Senior Research Scientist at Pearson), Emily Fyfe (2015 graduate; Assistant Professor at Indiana University), Abbey Loehr (2018 graduate; Research Director at Institute for School Partnership at Washington University in St. Louis), Ashli-Ann Douglas (current).
Masters and Major Area Paper Committee Member for Sarah Krowka (Special Education, 2017), Ayzit Doydum (CCN, 2016), Amelia Malone (Special Education, 2014), Jessica Min Namkung (Special Education, 2013), Michael Nelson (Quantitative Methods, 2013), Manya Whitaker (Developmental Science 2008), Jeff Nyquist

(Cognitive Science 2005), Liane Moneta (Cognitive and Cognitive Neuroscience, 2012) and Gillian Starkey (Cognitive and Cognitive Neuroscience, 2012)

Dissertation Committee Member for Sarah Krowka (Special Education, 2018), Michael Nelson (Quantitative Methods, 2017), Amber Wang (Special Education, 2016), Liane Moneta (Cognitive and Cognitive Neuroscience, 2015) and Gillian Starkey (Cognitive and Cognitive Neuroscience, 2014), Amelia Malone (Special Education, 2015), Jessica Min Namkung (Special Education, 2014), Gabrielle Strouse (Developmental Science 2011), Manya Whitaker (Developmental Science 2011), Rebecca Watchorn (Developmental Science, University of Alberta 2011), Shanta Hattikudur (Developmental Psychology, Univ. of Wisconsin-Madison 2011), Sarah Powell (Special Education 2009), Robin Schumacher (Special Education 2010), Maria Mendiburo (Leadership, Policy & Organization 2010), Daryl Schneider (Cognitive Psychology 2009), Sean Hurley (Cognitive Psychology), and Thomas Katzlberger (Computer Science).

Post-Doctoral Research Associate Advising

Erica Zippert (2016-)

Marci DeCaro (2009-2011; now Assistant Professor at Univ. of Louisville)

Michael R. Miller (2011-2013; now Research Associate, Children's Health Research Institute and Department of Paediatrics, Western University)

Roger Taylor (2008-2010 as secondary mentor; now Assistant Professor at SUNY-Oswego)

PROFESSIONAL SERVICE

James S. McDonnell Foundation Study Panel member for new funding program on translational research in cognitive science 2015 – 2016. Call for proposals under the new "Understanding Teacher Change and Teachers as Learners in K-12 Classrooms" was released in 2017: https://www.jsmf.org/apply/teachers-as-learners/

Spencer Foundation ad-hoc reviewer, 2017

Institute of Education Sciences' Basic Processes Scientific Review Panel, February 2010, 2011, 2012, Principle Panel Member 2014-2016. Post-Doctoral/Early Career Training Grant Panel 2013.

National Science Foundation Grant Review Panelist - CAREER - Learning Environments STEM, September 2014.

Editorial Boards for *Journal of Educational Psychology* 2008-2013, 2015-18; *Journal of Experimental Child Psychology* 2009-2017; *Journal of Cognition and Development* 2009 – 2019.

Guest Action Editor for *Journal of Experimental Psychology: General* 2012.

Ad-hoc reviewer for *British Journal of Educational Psychology, Child Development, Cognition and Instruction, Cognitive Development, Developmental Psychology, Developmental Science, Instructional Science, Journal of Experimental Psychology: General, Journal for Research in Mathematics Education, Learning and Instruction, Mathematical Thinking and Learning, Mind and Brain, ZDM Mathematics, U.S. Department of Education Practice Guides,* the National Science Foundation, Netherlands Organisation for Scientific Research, and Canadian Language and Literacy Research Network.

Member, Digital Promise Learner Positioning System Math Advisory Board (see, for example: https://lvp.digitalpromiseglobal.org/content-area/math-3-6)

UNIVERSITY, COLLEGE AND DEPARTMENTAL SERVICE

Service to University and Peabody College

Peabody representative, University Faculty Affairs committee, 2019-2020
Peabody representative, Lewis-Burke federal funding consultation committee, S2019
Member, PRI Director Search, 2015-2016, 2016-2017
Member, Special Education Faculty Search, 2015-2016, 2016-2017
Member, Faculty and Staff Benefits Committee, 2011-2014
Member, Faculty Council, 2011-2013, Chair of Curriculum Committee
Member, Peabody Faculty Award selection committee, 2012
Member, Peabody Endowed Chair Search committee, 2007-2009
Member, Peabody Diversity committee, 2007-2009
Graduate Faculty Delegate Assembly, 2006-2007; 2008-2009
Freshman advisor, 2003-2004; 2006-2007; 2008-2009
Member, Peabody Technology Committee 2003-2005
Member, IRB Task Force 2003-2004
Member, Peabody Learning Course Committee 2002-2003

Service to the Department

Department Chair, 2019-2021
Head, Developmental Sciences Program, Executive Committee member, 2013-2017
Search Committee Chair, 2013-14; 2014-15; 2015-16
Member, Undergraduate studies committee, 2011-2017
Member, Diversity committee, 2015-2017
Member, Faculty Review Committee, 2010-2011; 2012-2013; 2015-2016
Member, Developmental Psychology search committee 2003-2004; 2006-2007
Member, Graduate curriculum sub-committee, 2002-2003
Organizer, Graduate Student Psychology Day, 2006, 2007, 2009
Organizer, Psychological Sciences Graduate Student Recruitment Weekend, 2008

COMMUNITY SERVICE

"Creating a Math-Friendly Environment" (Jan, 2020) and "Math Patterns – Skills for Success" (Feb 2018) videos produced by Child Trends and disseminated on affiliate TV networks. https://www.childtrends.org/videos/math-patterns-skills-success https://positiveparentingnews.org/news-reports/creating-a-math-friendly-environment/

Expert roundtable member, National Governors Association Center for Best Practices, Strengthening early mathematics education initiative. 2013.

Member, Early Grades Math Advisory Committee, Tennessee Department of Education, Division of School Readiness and Early Learning, 2011.

Content developer, Tennessee Early Grades Math Toolkit, section in the Teacher Toolkit for Algebraic Thinking: readtennessee.org/math/teachers/teachers_mathematics_toolkit/mathematical_content_areas/algebraic_thinking.aspx

Speaker, Math Summit sponsored by Tennessee State Personnel Development Grant. February, 2012. Led 2 seminars with over 50 TN math teachers and instructional coaches.