

May 2021

ERIC KNUTH

College of Education
University of Texas at Austin

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EDUCATION

Ph.D. Instruction & Curriculum

Specialization in Mathematics Education
University of Colorado-Boulder

Certificate in Cognitive Science

Institute of Cognitive Science
University of Colorado-Boulder

M.A. Mathematics

San Diego State University

Secondary Mathematics & Physics Teaching Credential

San Diego State University

B.S. Electrical Engineering

University of Illinois-Champaign/Urbana

PROFESSIONAL EXPERIENCE

Program Director

Division of Research on Learning in Formal and Informal Settings
National Science Foundation (September, 2020 - present)

Professor

University of Texas at Austin, Department of Curriculum & Instruction (August, 2017 - present)

Director of the STEM Center

University of Texas at Austin (October, 2018 - September, 2020)

Professor

University of Wisconsin-Madison, Departments of Curriculum & Instruction and Educational Psychology (August, 2009 - August, 2017)

Associate Professor

University of Wisconsin-Madison, Departments of Curriculum & Instruction and Educational Psychology (August, 2005 - August, 2009)

Assistant Professor

University of Wisconsin-Madison, Departments of Curriculum & Instruction and Educational Psychology (August, 1999 - August, 2005)

Mathematics Teacher

Granite Hills High School, El Cajon, CA (August, 1991 - June, 1995)

Electrical Engineer

Naval Ocean Systems Center, San Diego, CA (July, 1984 - August, 1990)

RESEARCH SUPPORT

Co-Principal Investigator, *Broadening Participation in Mathematics for English Learners with Mathematics Difficulties: A Multi-Site Impact Study*, funded by the National Science Foundation (\$5,000,000). 2020-2025

Principal Investigator, *Fostering Productive Example Use in Proving-related Activities*, funded by the University of Texas at Austin College of Education Small Grants Program (\$5,906). Spring 2018-Summer 2018

Principal Investigator, *Identifying Effective Instructional Practices that Foster the Development of Algebraic Thinking in Elementary School*, funded by the National Science Foundation (\$1,378,542). 2017-2021

Co-Principal Investigator, *Building a Grades K-2 Early Algebra Learning Progression Prototype for Diverse Populations*, funded by the National Science Foundation (\$1,628,813). 2017-2020

Co-Principal Investigator, *Extending a Grades 3-5 Early Algebra Learning Progression into Grades K-2*, funded by the Institute of Education Sciences (\$1,399,920). 2017-2021

Co-Principal Investigator, *The Impact of a Teacher-Led Early Algebra Intervention on Children's Algebra-Readiness for Middle School*, funded by the Institute of Education Sciences (\$3,500,000). 2014-2018

Principal Investigator, *Retention of Early Algebraic Understanding*, funded by the National Science Foundation (\$47,787). 2015-2016

Co-Principal Investigator, *Postdoctoral Fellowship Program in Mathematical Thinking, Learning and Instruction*, funded by the Institute of Education Sciences (\$705,000). 2013-2016

Principal Investigator, *The Role and Use of Examples in Learning to Prove*, funded by the National Science Foundation (\$995,997). 2012-2016

Principal Investigator, *The Impact of Early Algebra on Students' Algebra-Readiness*, funded by the National Science Foundation (\$939,935). 2012-2016

Principal Investigator, *Mathematics Courses for Middle School Teachers: Examining the Influence on Teachers' Knowledge and Practice*, funded by the University of Wisconsin Graduate School Research Committee (\$26,244). 2011-2012

Principal Investigator, *Developing Algebra-Ready Students for Middle School: Exploring the Impact of Early Algebra*, funded by the National Science Foundation (\$1,578,658). 2009-2012

Co-Principal Investigator, *Postdoctoral Fellowship Program in Mathematical Thinking, Learning and Instruction*, funded by the Institute of Education Sciences (\$655,000). 2010-2013

Co-Principal Investigator, *How do Instructional Gestures Support Students' Mathematics Learning?* funded by the National Science Foundation (\$1,000,000). 2009-2012

Principal Investigator, *Understanding and Cultivating the Connections between Students' Natural Ways of Reasoning and Mathematical Ways of Reasoning*, funded by the National Science Foundation (\$741,938). 2008-2012

Co-Principal Investigator, *Does Visual Scaffolding Facilitate Students' Mathematics Learning? Evidence from Early Algebra*, funded by the Institute of Education Sciences (\$683,753). 2006-2009

Principal Investigator, *Understanding and Cultivating the Connections between Students' Natural Ways of Reasoning and Mathematical Ways of Reasoning*, funded by the University of Wisconsin Graduate School Research Committee (\$15,000). 2006-2007

Director, *Mentoring Mathematics Teachers*, professional development program funded by the Calculus Consortium for Higher Education (\$5,340). 2005-2006

Principal Investigator, *Understanding and Cultivating the Development of Students' Competencies in Justifying and Proving*, funded by the National Science Foundation Career Program (\$701,649). 2001-2006

Co-Principal Investigator, *Understanding and Cultivating the Transition from Arithmetic to Algebraic Reasoning*, funded by an Interagency Educational Research Initiative (NSF, NICHD, DOE) (\$5,798,281). 2001-2006

Director, *Teaching Mathematics with Technology Project*, professional development program funded by the University of Wisconsin System (\$98,804). 2000-2003

Principal Investigator, *Roles and Relationships in the Mentoring of Beginning Teachers*, funded by the University of Wisconsin Graduate School Research Committee (\$13,000). 1999-2000

HONORS & AWARDS

Mentoring Fellowship, University of Texas at Austin Graduate School, 2018 - 2019

Chair (2011 - 2013) and Executive Board member (2004 - 2006) of the AERA Special Interest Group for Research in Mathematics Education

Doris Schlesinger Award for Excellence in Mentoring finalist (UW-Madison), 2006 & 2009

National Council of Teachers of Mathematics Research Committee, 2008 - 2011

National Science Foundation Early Career Award, 2001 – 2006

AERA/Spencer Pre-Dissertation Fellowship, 1998-1999

PUBLICATIONS

Journal Articles

Stephens, A., Veltri Torres, R., Sung, Y., Strachota, S., Gardiner, A., Blanton, M., **Knuth, E.**, & Stroud, R. (In press). From “you have to have three numbers and a plus sign” to “It’s the exact same thing”: K–1 students learn to think relationally about equations. *Journal of Mathematical Behavior*.

Stephens, A., Stroud, R., Strachota, S., Stylianou, D., Blanton, M., **Knuth, E.**, & Murphy Gardiner, A. M. (In press). What early algebra knowledge persists one year after an elementary grades intervention? *Journal for Research in Mathematics Education*.

Stephens, A., Sung, Y., Strachota, S., Veltri Torres, R., Morton, K., Murphy Gardiner, A., Blanton, M., **Knuth, E.**, & Stroud, R. (In press). The role of balance scales in supporting productive thinking about equations among struggling and diverse learners. *Mathematical Thinking and Learning*.

Knuth, E., Kim, H., Zaslavsky, O., Vinsonhaler, R., Gaddis, D., & Fernandez, L. (2020). Teachers' views about the role of examples in proving-related activities. *Journal of Educational Research in Mathematics*, 30(2), 177-197.

Blanton, M., Isler, I., Stroud, R., Stephens, A., **Knuth, E.**, & Murphy Gardiner, A. (2019). Growth in children's understanding of generalizing and representing mathematical structure and relationships. *Educational Studies in Mathematics*, 102(2), 193-219.

Blanton, M., Stroud, R., Stephens, A., Murphy Gardiner, A., Stylianou, D. **Knuth, E.**, Isler-Baykal, I., & Strachota, S. (2019). Does early algebra matter? The effectiveness of an early algebra intervention in grades 3–5. *American Educational Research Journal*, 56(5), 1930-1972.

Ellis, A., Ozgur, Z., Vinsonhaler, R., Dogan, M., Carolan, T., Lockwood, E., Lynch, A., Sabouri, P., **Knuth, E.**, & Zaslavsky, O. (2019). Student thinking with examples: The criteria-affordances-purposes-strategies framework. *Journal of Mathematical Behavior*, 53, 263-283.

Knuth, E., Zaslavsky, O., & Ellis, A. (2019). The role and use of examples in learning to prove. *Journal of Mathematical Behavior*, 53, 256-262.

Ozgur, Z., Ellis, A., Vinsonhaler, R., Dogan, M., & **Knuth, E.** (2019). From examples to proof: Purposes, strategies, and affordances of example use. *Journal of Mathematical Behavior*, 53, 284-303.

Stylianou, D., Stroud, R., Cassidy, M., **Knuth, E.**, Stephens, A., Murphy Gardiner, A., & Demers, L. (2019). Putting early algebra in the hands of elementary school teachers: Examining fidelity of implementation and its relation to student performance. Submitted to *Infancia y Aprendizaje (Journal for the Study of Education and Development)*, 42(3), 523-569.

Zaslavsky, O., & **Knuth, E.** (2019). The complex interplay between examples and proving: Where are we and where should we head? *Journal of Mathematical Behavior*, 53, 242-244.

Alibali, M., & **Knuth, E.** (2018). Bridging psychology and mathematics education: Reflections on boundary crossing. *Journal of Numerical Cognition*, 4(1), 9-18.

Fonger, N., Stephens, A., Blanton, M., Isler, I., **Knuth, E.**, & Gardiner, A. (2018). Developing an early algebra learning progression for curriculum, instruction, and student learning. *Cognition & Instruction*, 30(1), 30-55.

Nardi, E., & **Knuth, E.** (2017). Changing classroom culture, curricula, and instruction for proof and proving: How amenable to scaling up, practicable for curricular integration, and capable of producing long-lasting effects are current interventions? *Educational Studies in Mathematics*, 267-274.

Stephens, A., Fonger, N., Strachota, S., Isler, I., Blanton, M., **Knuth, E.**, & Gardiner, A. (2017). A learning progression for elementary students' functional thinking. *Mathematical Thinking and Learning*, 19(3), 143-166.

Knuth, E., Stephens, A., Blanton, M., & Gardiner, A. (2016). Build an early foundation for algebra success. *Kappan*, 97(6), 65-68.

- Blanton, M., Stephens, A., **Knuth, E.**, Gardiner, A., Isler, I., & Kim, J.S. (2015). The development of children's algebraic thinking: The impact of a comprehensive early algebra intervention in third grade. *Journal for Research in Mathematics Education*, 46(1), 39-87.
- Stephens, A., Blanton, M., **Knuth, E.**, Isler, I., & Gardiner, A. (2015). Just say "YES" to early algebra. *Teaching Children Mathematics*, 22(2), 92-101.
- Alibali, M., Nathan, M., Wolfgram, M., Church, R. B., Jacobs, S., Martinez, C., & **Knuth, E.** (2014). How teachers link ideas in mathematics instruction using speech and gesture: A corpus analysis. *Cognition & Instruction*, 32(1), 65-100.
- Isler, I., Marum, T., Stephens, A., Blanton, M., **Knuth, E.**, & Gardiner, A. (2014). The string task: Not just for high school. *Teaching Children Mathematics*, 21(5), 282-292.
- Lockwood, E., & **Knuth, E.** (2014). Postdoctoral positions in mathematics education: Why so little interest? *Journal for Research in Mathematics Education*, 45(5), 542-549.
- Alibali, M., Nathan, M., Church, R. B., Wolfgram, M., Kim, S., & **Knuth, E.** (2013). Teachers' gestures and speech in mathematics lessons: Forging common ground by resolving trouble spots. *ZDM - International Reviews on Mathematical Education*, 45(3), 425-440.
- Alibali, M., Young, A., Crooks, N., Yeo, A., Wolfgram, M., Ledesma, M., Nathan, M., Church, R. B., & **Knuth, E.** (2013). Students learn more when their teacher has learned to gesture effectively. *Gesture*, 13(2), 210-233.
- Ko, Y. Y., & **Knuth, E.** (2013). Validating proofs and counterexamples across content domains: Practices of importance for mathematics majors. *Journal of Mathematical Behavior*, 32(1), 20-35.
- Stephens, A., **Knuth, E.**, Blanton, M., Isler, I., Murphy Gardiner, A., & Marum, T. (2013). Equation structure and the meaning of the equal sign: The impact of task selection in eliciting elementary students' understandings. *Journal of Mathematical Behavior*, 32(2), 173-182.
- Hattikudur, S., Prather, R., Asquith, P., Alibali, M., **Knuth, E.**, & Nathan, M. (2012). Constructing graphical representations: Middle schoolers' intuitions and developing knowledge about slope and y-intercept. *School Science and Mathematics*, 112(4), 230-240.
- Rasmussen, C., Heck, D., Tarr, J., **Knuth, E.**, White, D., Lambdin, D., Baltzley, P., & Quander, J. (2011). Trends and issues in high school mathematics: Research insights and needs. *Journal for Research in Mathematics Education*, 42(3), 204-219.
- Boerst, T., Confrey, J., Heck, D., **Knuth, E.**, Lambdin, D., White, D., Baltzley, P., & Quander, J. (2010). Strengthening research by designing for coherence and connections to practice. *Journal for Research in Mathematics Education*, 41(3), 216-235.
- McNeil, N., Weinberg, A., Stephens, A., Hattikudur, S., Asquith, P., **Knuth, E.**, & Alibali, M. (2010). A is for apple: Mnemonic symbols hinder students' interpretation of algebraic expressions. *Journal of Educational Psychology*, 102(3), 625-634.
- Knuth, E.**, Choppin, J., & Bieda, K. (2009). Proof in middle school: Moving beyond examples. *Mathematics Teaching in the Middle School*, 15(4), 206-211.
- Ko, Y., & **Knuth, E.** (2009). Undergraduate mathematics majors' writing performance producing proofs and counterexamples in continuous functions. *Journal of Mathematical Behavior*, 28(1), 68-77.

Battista, M., Boester, T., Confrey, J., **Knuth, E.**, Smith, M., Sutton, J., White, D., & Quander, J. (2009). Research in mathematics education: Multiple methods for multiple uses. *Journal for Research in Mathematics Education*, 40(3), 216-240.

Knuth, E., Alibali, M., Hattikudur, S., McNeil, N., & Stephens, A. (2008). The equal sign: A topic of importance for middle school mathematics. *Mathematics Teaching in the Middle School*, 13(9), 514-519.

Alibali, M., **Knuth, E.**, Hattikudur, S., McNeil, N., & Stephens, A. (2007). A longitudinal examination of middle school students' understandings of the equal sign and performance solving equivalent equations. *Mathematical Thinking and Learning*, 9(3), 221-247.

Asquith, P., Stephens, A., **Knuth, E.**, & Alibali, M. (2007). Middle school teachers' understanding of core algebraic concepts: Equal sign and variable. *Mathematical Thinking and Learning*, 9(3), 249-272.

Hyde, J., Else-Quest, N., Alibali, M., **Knuth, E.**, & Romberg, T. (2006). Mathematics in the home: Homework practices and mother-child interactions doing mathematics. *Journal of Mathematical Behavior*, 25(2), 136-152.

Knuth, E., Stephens, A., McNeil, N., & Alibali, M. (2006). Does understanding the equal sign matter? Evidence from solving equations. *Journal for Research in Mathematics Education*, 37(4), 297-312.

McNeil, N., Grandau, L., **Knuth, E.**, Alibali, M., Stephens, A., Hattikudur, S., & Krill, D. (2006). Middle-school students' understanding of the equal sign: The books they read can't help. *Cognition & Instruction*, 24(3), 367-385.

Cai, J. & **Knuth, E.** (2005). The development of students' algebraic thinking in earlier grades: Multiple perspectives. *Zentralblatt für Didaktik der Mathematik* (International Reviews on Mathematical Education), 37(1), 1-4.

Knuth, E., Alibali, M. W., Weinberg, A., McNeil, N., & Stephens, A. (2005). Middle school students' understanding of core algebraic concepts: Equality & variable. *Zentralblatt für Didaktik der Mathematik* (International Reviews on Mathematical Education), 37(1), 68-76.

Peressini, D., Borko, H., Romagnano, L., **Knuth, E.**, & Willis-Yorker, C. (2004). A conceptual framework for learning to teach secondary mathematics: A situative perspective. *Educational Studies in Mathematics*, 56(1), 67-96.

Knuth, E. & Peterson, B. (2003). Fostering mathematical curiosity: Highlighting the mathematics. *Mathematics Teacher*, 96(8), 574-579.

Nathan, M. & **Knuth, E.** (2003). A study of whole classroom mathematical discourse and teacher change. *Cognition & Instruction*, 21(2), 175-207.

Knuth, E. (2002). Secondary school mathematics teachers' conceptions of proof. *Journal for Research in Mathematics Education*, 33(5), 379-405.

Knuth, E. (2002). Teachers' conceptions of proof in the context of secondary school mathematics. *Journal of Mathematics Teacher Education*, 5(1), 61-88.

Knuth, E. (2002). Proof as a tool for learning mathematics. *Mathematics Teacher*, 95(7), 486-490.

Knuth, E. (2002). Fostering mathematical curiosity. *Mathematics Teacher*, 95(2), 126-130.

Knuth, E. & Peressini, D. (Summer/Fall, 2001). A theoretical framework for examining discourse in mathematics classrooms. *Focus on Learning Problems in Mathematics*, 23(2/3), 5-22.

Knuth, E. & Peressini, D. (2001). Unpacking the nature of discourse in mathematics classrooms. *Mathematics Teaching in the Middle School*, 6(5), 320-325.

Borko, H., Peressini, D., Romagnano, L., **Knuth, E.**, Willis-Yorker, C., Wooley, C., Hovermill, J., & Masarik, K. (2000). Teacher education does matter: A situative view of learning to teach secondary mathematics. *Educational Psychologist*, 35(3), 193-206.

Knuth, E. (2000). Student understanding of the Cartesian Connection: An exploratory study. *Journal for Research in Mathematics Education*, 31(4), 500-508.

Knuth, E. (2000). Student understanding of connections between equations and graphs. *Mathematics Teacher*, 93(1), 48-53.

Knuth, E. (May/June, 2000). The rebirth of proof in school mathematics in the United States? *International Newsletter on the Teaching and Learning of Mathematical Proof* [On-line]. Available: <http://www-cabri.imag.fr/Preuve/>.

Peressini, D. & **Knuth, E.** (2000). The role of tasks in developing communities of mathematical inquiry. *Teaching Children Mathematics*, 6(6), 391-397.

Knuth, E. & Elliott, R. (1998). Characterizing the nature of students' understandings of mathematical proof. *Mathematics Teacher*, 91(8), 714-717.

Peressini, D. & **Knuth, E.** (1998). Why are you talking when you could be listening? The role of discourse in the professional development of mathematics teachers. *Teaching and Teacher Education*, 14(1), 107-125.

Books, Book Chapters, and Monographs

Knuth, E., Zaslavsky, O., & Kim, H. (Accepted). Argumentation, justification and proof in middle school: A rose by any other name. To appear in K. Bieda, A. Conner, K. Kosko, & M. Staples (Eds.), *Conceptions and consequences of argumentation, justification and proof*. Heidelberg, Germany: Springer.

Blanton, M., Brizuela, B., Stephens, A., **Knuth, E.**, Isler, I., Gardiner, A., & Demers, L., Fonger, N., & Stylianou, D. (2018). Implementing a framework for early algebra. In C. Kieran (Ed.), *Teaching and learning algebraic thinking with 5- to 12-year-olds* (pp. 27-49). ICME-13 Monographs. Heidelberg, Germany: Springer.

Strachota, S., **Knuth, E.**, & Blanton, M. (2018). Cycles of generalizing activities in the classroom. In C. Kieran (Ed.), *Teaching and learning algebraic thinking with 5- to 12-year-olds* (pp. 351-378). ICME-13 Monographs. Heidelberg, Germany: Springer.

Stephens, A., & **Knuth, E.** (2017). Algebraic reasoning in grades 6-8. In M. Battista (Ed.), *Reasoning and sense making in the elementary grades* (pp. 57-81). Reston, VA: National Council of Teachers of Mathematics.

Bolt, D., Kim, J., Blanton, M., & **Knuth, E.** (2016). Applications of item response theory in

mathematics education research. In A. Izsak, J. Remillard, & J. Templin (Eds.), *Psychometric methods in mathematics education: Opportunities, challenges, and interdisciplinary collaborations* (pp. 31-52). *Journal for Research in Mathematics Education Monograph*.

Knuth, E., & Stephens, A. (2016). Understanding the equal sign really does matter! In E. Silver & P. Kenney (Eds.), *More lessons learned from research, Volume 2* (pp. 135-139). Reston, VA: National Council of Teachers of Mathematics.

Knuth, E. (2015). Teachers and proof in school mathematics. In E. Silver & P. Kenney (Eds.), *More lessons learned from research, Volume 1* (pp. 39-48). Reston, VA: National Council of Teachers of Mathematics.

Ellis, A.B., Bieda, K., & **Knuth, E.** (2012). *Essential understandings project: Reasoning and Proving in High School Mathematics (Gr. 9-12)*. Reston, VA: National Council of Teachers of Mathematics.

Knuth, E., Kalish, C., Ellis, A., Williams, C., & Felton, M. (2011). Adolescent reasoning in mathematical and non-mathematical domains: Exploring the paradox. In V. Reyna, S. Chapman, M. Dougherty, & J. Confrey (Eds.), *The adolescent brain: Learning, reasoning, and decision making* (pp. 183-209). Washington, DC: American Psychological Association.

Cai, J., & **Knuth, E.** (2011). *Early algebraization: A global dialogue from multiple perspectives*. Heidelberg, Germany: Springer.

Knuth, E., Alibali, M., Weinberg, A., McNeil, N., & Stephens, A. (2011). Middle school students' understanding of core algebraic concepts: Equality & variable. In J. Cai and E. Knuth (Eds.), *Early algebraization: A global dialogue from multiple perspectives* (pp. 259-276). Heidelberg, Germany: Springer.

Knuth, E., Choppin, J., & Bieda, K. (2009). Middle school students' production of mathematical justifications. In D. Stylianou, M. Blanton, & E. Knuth (Eds.), *Teaching and learning proof across the grades: A K-16 perspective* (pp. 153-170). New York, NY: Routledge.

Stylianou, D., Blanton, M., & **Knuth, E.** (2009). *Teaching and learning proof across the grades: A K-16 perspective*. New York, NY: Routledge.

Knuth, E., & Elliott, R. (2008). Characterizing students' understanding of mathematical proof. In P. Elliott & C. Garnett (Eds.), *Getting into the mathematical conversation* (pp. 78-84). Reston, VA: NCTM.

Knuth, E. & Hartmann, C. (2005). Using technology to foster students' mathematical understandings and intuitions. In W. Masalski (Ed.), *2005 Yearbook, Technology-Supported Mathematics Learning Environments* (pp. 151-164). Reston, VA: National Council of Teachers of Mathematics.

Peressini, D. & **Knuth, E.** (2005). The role of technology in representing mathematical problem situations and concepts. In W. Masalski (Ed.), *2005 Yearbook, Technology-Supported Mathematics Learning Environments* (pp. 277-290). Reston, VA: National Council of Teachers of Mathematics.

Peressini, D. & **Knuth, E.** (1998). The importance of algorithms in performance based assessments. In M. Kenney (Ed.), *1998 Yearbook, Teaching and Learning Algorithms in School Mathematics* (pp. 56-68). Reston, VA: National Council of Teachers of Mathematics.

Reports

Arbaugh, F., Herbel-Eisenmann, B., Ramirez, N., **Knuth, E.**, Kranendonk, H., & Quander, J. (2010). *Linking research and practice: The NCTM Research Agenda Report*. Reston, VA: NCTM.

Curriculum Materials

Blanton, M., Gardiner, A., Stephens, A., & **Knuth, E.** (2020). *LEAP: Learning through an Early Algebra Progression, Grade 3*. Rowley, MA: Didax.

Blanton, M., Gardiner, A., Stephens, A., & **Knuth, E.** (2020). *LEAP: Learning through an Early Algebra Progression, Grade 4*. Rowley, MA: Didax.

Blanton, M., Gardiner, A., Stephens, A., & **Knuth, E.** (2020). *LEAP: Learning through an Early Algebra Progression, Grade 5*. Rowley, MA: Didax.

Conference Proceedings

Knuth, E., Zaslavsky, O., Vinsonhaler, R., Gaddis, D., & Fernandez, L. (November, 2019). Middle school teachers' beliefs about the role of examples in proving-related activities. In S. Otten, A. Candela, Z. de Arujajo, C. Haines, & C. Munter (Eds.), *Proceedings of the Forty-first Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 1718-1722.

Ristroph, I., Kim, H., Morton, K., **Knuth, E.**, Gertenbach, R., & Miller, B. (November, 2019). Fostering algebraic thinking in elementary school: Teachers' use of visualizations. In S. Otten, A. Candela, Z. de Arujajo, C. Haines, & C. Munter (Eds.), *Proceedings of the Forty-first Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 224-225.

Knuth, E., Ellis, A., & Zaslavsky, O. (July, 2016). The role of examples in proving-related activities. *Proceedings of the Thirteenth International Congress on Mathematical Education*.

Lockwood, E., Ellis, A., & **Knuth, E.** (February, 2013). Mathematicians' example-related activity when proving conjectures. In S. Brown, G. Karakok, K. Hah Roh, & M. Oehrtman (Eds.), *Proceedings of the Sixteenth Annual Conference on Research in Undergraduate Mathematics Education*, 16-30. [Received Honorable Mention Award for Best Conference Paper.]

Ellis, A., Lockwood, E., Williams, C., Dogan, M., & **Knuth, E.** (November, 2012). Middle school students' example use in conjecture exploration and justification. In L. Van Zoest, J.J. Lo, & J. Kratky (Eds.), *Proceedings of the Thirty-fourth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 135-142.

Lockwood, E., Ellis, A., Dogan, M., Williams, C., & **Knuth, E.** (November, 2012). A framework for mathematicians' example-related activity when exploring and proving mathematical conjectures. In L. Van Zoest, J.J. Lo, & J. Kratky (Eds.), *Proceedings of the Thirty-fourth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 151-158.

Williams, C., Akinsiku, O., Walkington, C., Cooper, J., Ellis, A., Kalish, C., & **Knuth, E.** (October, 2011). Understanding students' similarity and typicality judgments in and out of mathematics. *Proceedings of the Thirty-third Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, pp. 1180–1189.

Cooper, J., Walkington, C., Williams, C., Akinsiku, O., Kalish, C., Ellis, A., & **Knuth, E.** (July, 2011). Adolescent reasoning in mathematics: Exploring middle school students' strategic approaches in empirical justifications. In L. Carlson, C. Hölscher, & T. Shipley (Eds.), *Proceedings of the Thirty-third Annual Conference of the Cognitive Science Society*, 2188–2193.

Ko, Y., **Knuth, E.**, & Shy, H. (July, 2008). Taiwanese undergraduates' performance constructing proofs and generating counterexamples in differentiation. *Proceedings of the Eleventh International Congress on Mathematics Education*.

Ko, Y., **Knuth, E.**, & Shy, H. (February, 2008). Taiwanese undergraduates' proof performance in the domain of continuous functions. *Proceedings of the Conference on Research in Undergraduate Mathematics Education*.

Bieda, K., Holden, C., & **Knuth, E.** (October, 2006). Does proof prove? Students' emerging beliefs about generality and proof in middle school. *Proceedings of the Twenty-eighth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 395-402.

Knuth, E. & Sutherland, J. (October, 2004). Student understanding of generality. *Proceedings of the Twenty-sixth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 561-567.

McNeil, N., Grandau, L., Stephens, A., Krill, D., Alibali, M. W., & **Knuth, E.** (October, 2004). Middle-school students' experience with the equal sign: *Saxon Math* does not equal *Connected Mathematics*. *Proceedings of the Twenty-sixth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 271-275.

Brendefur, J. & **Knuth, E.** (July, 2004). Elementary students' use of conjectures to deepen understanding. *Proceedings of the Twenty-eighth Annual Meeting of the International Group for the Psychology of Mathematics Education*, 292.

Knuth, E., Choppin, J., Slaughter, M., & Sutherland, J. (October, 2002). Mapping the conceptual terrain of middle school students' competencies in justifying and proving. *Proceedings of the Twenty-fourth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 1693-1700.

Knuth, E. & Peressini, D. (July, 2001). A theoretical framework for examining discourse in mathematics classrooms. *Proceedings of the Twenty-fifth Annual Meeting of the International Group for the Psychology of Mathematics Education*, 327.

Peressini, D. & **Knuth, E.** (November, 1998). The dualistic nature of school mathematics discourse. *Proceedings of the Twentieth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 227-233.

Elliott, R. & **Knuth, E.** (October, 1997). Teacher change: Developing an understanding of meaningful mathematics discourse. *Proceedings of the Nineteenth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 285-290.

Knuth, E. & Elliott, R. (October, 1997). Preservice secondary mathematics teachers' interpretations of mathematical proof. *Proceedings of the Nineteenth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 545-552.

Peressini, D. & **Knuth, E.** (October, 1997). Those who talk, those who listen, ever the twain shall meet: Further examining the role of discourse in the professional development of mathematics teachers. *Proceedings of the Nineteenth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 306.

Knuth, E. (October, 1996). Discourse and development of conceptual understanding in the elementary mathematics classroom. *Proceedings of the Eighteenth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 157.

Knuth, E. (October, 1995). Student understanding of the equivalence between algebraic and graphical representations of a function. *Proceedings of the Seventeenth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, 304.

SCHOLARLY PRESENTATIONS (last 5 years)

Invited/Plenary Talks:

The Development and Implementation of a Grades 3-5 Early Algebra Program, USC Rossier School of Education Herman and Rasiej Math Initiative Lecture Series, Los Angeles, CA (March, 2021)

The Role of Examples in Proving-related Activities, Research in Undergraduate Mathematics Education Annual Conference, Boston, MA (February, 2020)

Fostering the Development of Students Learning to Prove, Conference of Joint Korean Societies for Mathematics Education, Ajou University, South Korea (December, 2019)

Developing a Comprehensive Approach to Early Algebra, Colloquium for the Center for Mathematics Education, University of Maryland, College Park, MD (October, 2019)

The Role and Use of Examples in Learning to Prove, Colloquium in the Department of Mathematics, Texas State University, San Marcos, TX (September, 2019)

Developing a Comprehensive Approach to Early Algebra, Colloquium in the Department of Mathematics Education, Seoul National University, South Korea (August, 2019)

The Role and Use of Examples in Learning to Prove, 15th International Conference of Korean Women Society in Mathematical Science, Seoul National University, South Korea (August, 2019)

Understanding the Connections between Students' Ways of Reasoning In and Out of Mathematics, Mathematics Education Research Center Symposium on Mathematics Education, Seoul National University, South Korea (August, 2019)

Developing a Comprehensive Approach to Early Algebra, Colloquium in the Department of Mathematics, Texas State University, San Marcos, TX (April, 2019)

Developing Students' Mathematical Curiosity, Reasoning, and Sense-making, Gyeongnam International Conference on Mathematics Education, Changwon, South Korea (August, 2018)

The Impact of Early Algebra of Students' Algebra-Readiness, Tennessee STEM Education Research Conference, Knoxville, TN (February, 2017)

The Role of Examples in Proving-Related Activities, International Congress on Mathematical Education, Hamburg, Germany (July, 2016)

Research Presentations:

Middle School Teachers' Beliefs about the Role of Examples in Proving-related Activities, Psychology of Mathematics Education annual meeting, St. Louis, MO (November, 2019)

Developing a Comprehensive Approach to Early Algebra, AERA Annual Meeting, Toronto, Canada (April, 2019)

Shifts in the Field of Research in Mathematics Education, AERA Annual Meeting, New York, NY (April, 2018)

COURSES TAUGHT

UT-Austin

Teacher Certification Program (Undergraduate):

- *Teaching Elementary School Mathematics* (EDC 370E)

STEM Education (Graduate):

- *Research on Learning Trajectories and Learning Progressions* (STM 390T)

- *Curricular History and Development in STEM Education* (STM 386)

UW-Madison

Teacher Certification Program:

- *Methods in Secondary Mathematics Education* (C&I 393)

- *Uses of Technologies in Secondary School Mathematics* (C&I 395)

- *Epistemology of Mathematics for Teachers* (C&I 635)

Teacher Education / Professional Development (Graduate):

- *Action Research in School* (C&I 626)

- *Teaching Mathematics with Technology* (C&I 675)

Mathematics Education (Graduate):

- *The Study of Teaching* (C&I / EdPsych 708)

- *Goals, Content, and Programs in Mathematics Education* (C&I 810)

- *The Instruction of Mathematics* (C&I 811)

- *Curricular Issues in Mathematics Education* (C&I 812)

- *Seminar in Research on Mathematics Education* (C&I 942)

PROFESSIONAL SERVICE

Activities:

Editorial Board, *Review of Educational Research* (2021-)

Chair (2011-2013) and Executive Board (2004-2006) of the AERA Special Interest Group: Research in Mathematics Education

National Council of Teachers of Mathematics Research Committee (2008-2011)

Editorial Board, *NCTM Compendium of Research in Mathematics Education*

Editorial Board, *Advances in Mathematics Teaching and Learning* book series

Editor, Special Issue on Early Algebra, *Journal of Educational Research in Mathematics*

Editor, Special Issue on Reimagining Mathematics Education for the 21st Century in the 21st Century, *Journal of Educational Research in Mathematics*

Editor, Special Issue on Mathematical reasoning, argumentation and proof, *Journal of Educational Research in Mathematics*

Research Project Advisory Board member (last 5 years):

- *Investigation of Beginning Teachers' Expertise to Teach Mathematics via Reasoning and Proof* (NSF Career)
- *Exploring Teacher Noticing of Students' Multimodal Algebraic Thinking* (NSF Career)
- *Evaluation of the Authentic Intellectual Work Initiative* (IES)
- *The Role of Feedback in Digital Games* (NSF)
- *Learning Algebra and Methods of Proof* (NSF)
- *Pre-service Middle School Teachers' Knowledge of Mathematical Argumentation and Proving* (NSF)
- *Learning by Teaching a Synthetic Peer: Investigating the Effect of Tutor Scaffolding for Tutor Learning* (NSF)
- *Predictors and Consequences of Early Understanding of Mathematical Equivalence* (NSF Career)
- *Using Routines as an Instructional Tool for Developing Students' Conceptions of Proof* (NSF)
- *Understanding and Teaching the Processes Used to Comprehend Mathematical Arguments and Proofs* (NSF)
- *Fostering conceptual understanding and skill with an intelligent tutoring system for equation solving* (NSF)

Research Proposal Reviewer:

National Science Foundation

Institute of Education Sciences

Social Sciences and Humanities Research Council of Canada

Israeli Research Foundation

Manuscript & Conference Proposal Reviewer:

Journals: *Journal for Research in Mathematics Education*; *Mathematics Teacher*; *Journal of Mathematical Behavior*; *Cognition and Instruction*; *Mathematical Thinking and Learning*; *Learning Disability Quarterly*

Conferences: Psychology of Mathematics Education annual meeting; American Educational Research Association annual meeting; NCTM Research Conference

FORMER PhD STUDENTS & POSTDOCTORAL FELLOWS

Ph.D. Students

Professor Kristen Bieda, Michigan State University

Professor Jeff Choppin, University of Rochester

Professor Muhammed (Fatih) Dogan, Adiyaman University, Adiyaman, Turkey

Professor Luis Fernández, University of Texas, Rio Grande Valley

Dr. Michael Fish, Director of Research and Teacher Education, NCTM

Dr. Christopher Hartmann, Director of Curriculum and Instruction, BetterLesson
Professor Isil Isler, Middle East Technical University, Ankara, Turkey
Professor Yi-Yin (Winnie) Ko, Indiana State University
Professor Joan Kwako, University of Minnesota
Professor Diler Oner, Bogazici University, Istanbul, Turkey
Professor Lindsay Reiten, Northern Colorado University
Dr. Rachaya Srisurichan, Ministry of Education, Thailand
Dr. Ana Stephens, Research Scientist, Wisconsin Center for Education Research, UW-Madison
Dr. Suzanne Strachota, Miami University

Postdoctoral Fellows

Professor Elise Lockwood, Oregon State University
Professor Nicole Fonger, Syracuse University
Professor José Francisco Gutiérrez, University of Utah
Professor Karisma Morton, University of North Texas