

# Mitchell J. Nathan

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## Education

- PhD University of Colorado at Boulder, Cognitive Psychology (Chair, Prof. Walter Kintsch). A theory of word problem comprehension and its implications for the design of learning environments. August, 1991.
- MA University of Colorado at Boulder, Psychology (Chair, Prof. Walter Kintsch) Recall of stories and story problems. August, 1988.
- BS Carnegie Mellon University, Triple major in Electrical and Computer Engineering (BSEE), History (BA), and Mathematics (BS). May, 1984.

## Scholarly Appointments

Professor, University of Wisconsin-Madison, School of Education, Department of Educational Psychology (Learning Sciences). August, 2007 to date.

Director, Center on Education and Work, School of Education, University of Wisconsin-Madison, Dec. 2011 to 2018.

Affiliate Professor, Psychology Department University of Wisconsin-Madison, College of Letters and Sciences. August, 2004 to date.

Affiliate Professor, Department of Curriculum and Instruction (Mathematics Education and Science Education), University of Wisconsin-Madison, School of Education. August, 2004 to date.

Affiliate Professor, Center on Education and Work, University of Wisconsin-Madison, School of Education, Oct. 2007 to 2011.

Associate Professor with tenure, University of Wisconsin-Madison, School of Education, Department of Educational Psychology. August, 2004 to August, 2007.

Affiliate Professor, Wisconsin Center for Education Research (WCER), University of Wisconsin-Madison, School of Education, July, 2004 to date.

Associate Professor with tenure, University of Colorado-Boulder, School of Education, Educational Psychology. June, 2002 to July, 2004.

Fellow, Institute of Cognitive Science, University of Colorado-Boulder. Aug. 1995 to 2004.

Assistant Professor, University of Colorado-Boulder, School of Education, Educational Psychology. Aug. 1995 to June, 2002.

Senior Research Associate, Learning Technology Center, Peabody College, Vanderbilt University. Develop and assess multimedia-based instructional environments for mathematics and science learning for JH and H S grades. Sept. 1993 to Aug. 1995.

Post-Doctoral Research Fellow, University of Pittsburgh, Learning Research and Development Center (LRDC). Sept. 1991 to Aug. 1993.

Research Scientist in Intelligent Tutoring and Distributed Intelligent Systems, U S West Advanced Technologies, Boulder, CO. Sept. 1989 to Aug. 1991.

Consultant in artificial intelligence (AI) and software design and development, Boulder Heuristics, Inc., Boulder, CO. Apr, 1987 to Sept, 1989.

Engineer, Martin Marietta Denver Aerospace Robotics Lab. Hardware and software design for low and high-level real-time robotic vision systems and mobile robots. Jun, 1984 to Aug. 1986.

Research Assistant, "Social implications of robotics." Carnegie Mellon University, Dept. of Engineering & Public Policy / Robotics Institute. June, 1983 to May, 1984.

## **Administrative Positions**

Director, MAGIC Lab, Wisconsin Center for Education Research, University of Wisconsin-Madison. Aug. 2010 to date. Mathematical Action and Gesture in Instruction and Cognition. Develop theory, research methods, and digital learning resources (visual novels, video games, AR/VR) for the study and improvement of mathematical thinking, teaching, learning, and assessment based on the grounded and embodied learning (GEL) framework.

Director, Center on Education and Work, School of Education, University of Wisconsin-Madison, Dec. 2011 to 2018. Center houses research and development on academic and career planning, workforce development, and STEM education learning, teaching, and policy research.

Director, Postdoctoral Training Program in <sup>[SEP]</sup>Mathematical Thinking, Learning, and Instruction, University of Wisconsin-Madison, Mar. 2010 – Aug. 2017.

Co-Chair, Program Committee for the Tenth International Conference on Computer Supported Collaborative Learning (CSCL10), Madison, WI. 2011-2013.

Chair-designate (2008), and Chair (2009-2011), Annual Meeting Policies and Procedures Committee, American Educational Research Association (AERA).

Chair, Learning Sciences Program, Department of Educational Psychology, School of Education, University of Wisconsin-Madison, 2005-2010.

Program Chair, Division C of American Educational Research Association (AERA), 2007-2008.

Founding Secretary/Treasurer, International Society of the Learning Sciences (ISLS), 2002-2005.

Chair, Educational Psychology, University of Colorado-Boulder, Fall, 1998.

### **Visiting Scholar Appointments**

Visiting Lecturer, Latin American School for Education, Cognitive, and Neural Sciences, Buenos Aires, Argentina. Integrative Neuroscience Laboratory of the Torcuato Di Tella University, March, 2016

Visiting Lecturer, Latin American School for Education, Cognitive, and Neural Sciences, San Pedro de Atacama, Chile. Centro de Investigación Avanzada en Educación – Universidad de Chile/Center for Advanced Research in Education University of Chile, March, 2015

Visiting Lecturer, Latin American School for Education, Cognitive, and Neural Sciences, Punta del Este, Uruguay, March 2014

Visiting Lecturer, Latin American School for Education, Cognitive, and Neural Sciences, Commandatuba, Bahia, Brazil, March 2013

Visiting Professor, Department of Psychology, University of California-Santa Barbara, Jan-Mar 2012

Visiting Lecturer, Latin American School for Education, Cognitive, and Neural Sciences, El Calafate, Patagonia, Argentina. March 2012

Visiting Lecturer, Latin American School for Education, Cognitive, and Neural Sciences, San Pedro de Atacama, Chile. Centro de Investigación Avanzada en Educación – Universidad de Chile/Center for Advanced Research in Education University of Chile, March, 2011

Honorary Fellow, Dept. of Educational Psychology, School of Education, University of Wisconsin-Madison. Jan. – Jul. 2003

### **Research Grants and Fellowships**

Principal Investigator, “Understanding Teacher Change and Teachers as Learners in K-12 Classrooms (TAL),” James S. McDonnell Foundation. Award: \$353,656 (direct costs), Jan. 2021 – Dec., 2023.

Co-Principal Investigator, “Exploring Collaborative Embodiment for Learning (EXCEL): Understanding Geometry Through Multiple Modalities,” from the U. S. Dept. of Education-Institute of Educational Sciences (IES). Grant No. R305A200401. Award: \$1.4M, August 2020 – July 2024, with C. Walkington (PI; Southern Methodist University).

Principal Investigator, “DCL: Synthesis and Design Workshop: The Future of Embodied Design for Mathematical Imagination and Cognition,” National Science Foundation (NSF) DRL – Core R&D NSF-DCL Grant #1824662. Award: \$99,996, Sep. 01, 2018 - Aug 31, 2020.

Principal Investigator, “Teachers as Learners Program,” James S. McDonnell Foundation. Award: \$325,031, May, 2017 – April, 2020 (NCE till April, 2021).

Principal Investigator, “How Dynamic Gestures and Directed Actions Contribute to Mathematical Proof Practices,” from the U. S. Dept. of Education-Institute of Educational Sciences (IES). Grant No. R305A160020. Award: \$1.4M, July 2016 – June 2020, with P. Steiner and C. Walkington (Southern Methodist University) (NCE till June 2022).

Hilldale Undergraduate/Faculty Research Fellowship, University of Wisconsin-Madison. \$3,500. 2015-2016 James Xu, Student PI.

Principal Investigator, “Postdoctoral Training Program in<sup>[1]</sup> Mathematical Thinking, Learning, and Instruction,” from the U. S. Dept. of Education-Institute of Educational Sciences (IES). Grant No. R305B130007. Award: \$686,999 Sep. 2013 – Aug. 2017, with M. W. Alibali, A. Ellis, C. Kalish, E. Knuth, P. Steiner, & A. Wager.

Co-Principal Investigator, “Connecting Mathematical Ideas through Animated Multimodal Instruction,” from U. S. Dept. of Education-Institute of Education Sciences, Cognition and Student Learning Program. Grant No. R305A130016. Award: \$1,599,991 Jun 2013 – May 2019 (NCE), with M. W. Alibali (PI), V. Popescu (Purdue), N. Adamo-Villani (Purdue), and S. Cook (U. Iowa).

Co-Principal Investigator (PI for University of Wisconsin sub-award), “National Center for Cognition and Mathematics Instruction” from U. S. Dept. of Education-Institute of Education Sciences, Education Research and Development Centers Program. Grant No. R305C100024. Award: \$9,998,406 Sep. 2010 – Aug. 2015, with Steven Schneider (PI, WestEd), James Pellegrino (UIC), Susan Goldman (UIC), Kenneth Koedinger (CMU), Neil Heffernan (WPI), Julie Booth (Temple), Martha W. Alibali (UW), Diane Briars (Pittsburgh Public Schools), and Shandy Hauk (WestEd).

Principal Investigator, “Postdoctoral fellowship program in mathematical thinking, learning and instruction” from the U. S. Dept. of Education-Institute of Educational Sciences (IES; Grant No. R305B100007). Award: \$655,000 Aug. 2010 – Jul. 2015, with M. W. Alibali, A. Ellis, D. Kaplan, C. Kalish, E. Knuth, & A. Wager.

Co-Principal Investigator, "How does teachers' visual scaffolding support students' mathematics learning?" from National Science Foundation Research and Evaluation on Education in Science and Engineering (NSF-REESE). DRL 0909699. Award \$999,789 Sep 2009 - Aug 2012, with M. W. Alibali (PI), E. Knuth, and R. B. Church (Northeastern Illinois University).

Principal Investigator, “Tangibility for the teaching, learning, and communicating of mathematics,” (Sub-Award from San Diego State University; Ricardo Nemirovsky, PI) from National Science Foundation Research and Evaluation on Education in Science and Engineering (NSF-REESE, DRL-0816406). (Sub-Award \$645,000 Sep. 2008-Aug. 2013. Full Award \$2,000,000) With M. W. Alibali (University of Wisconsin–Madison), R. Hall and K. Leander (Vanderbilt University).

Co-Principal Investigator (PI for University of Wisconsin School of Education sub-award), “Aligning educational experiences with ways of knowing engineering (AWAKEN),” sponsored by

the National Science Foundation Engineering Education Program (NSF-EEP; Grant No. EEC-0648267). (Award \$978,000 July 2007-June 2010; No Cost Extension through Aug. 2011) With S. Courter (PI) and A. Phelps.

Co-Principal Investigator, "Does Visual Scaffolding Facilitate Students' Mathematics Learning? Evidence From Early Algebra," sponsored by the U. S. Dept. of Education-Institute of Educational Sciences (IES; Grant No. R305H060097). (Award: \$982,736, Sept. 2006 – Aug. 2009; No Cost Extension through Aug. 2011). With M. W. Alibali (PI), E. Knuth, and R. B. Church (Northeastern Illinois University).

Principal Investigator, "STAAR Teacher professional development project." Sub-contract from Carnegie Mellon University (\$280,000 Oct. 2004-Sept. 2007).

Principal Investigator, "Collaborative Research: Understanding and Cultivating the Transition from Arithmetic to Algebraic Reasoning." Sub-contract from the University of Colorado (\$104,266 July 2004 - Sept. 2006).

Principal Investigator, "Understanding and Cultivating the Transition from Arithmetic to Algebraic Reasoning," sponsored by the Interagency Education Research Initiative (IERI; a collaboration of NSF, Dept. Of Education-OERI/IES, and NIH-NICHHD; total award \$5,798,281 Oct. 2001–Sep. 2006). (NSF 0115609, 0115635 and 0115661 under IERI collaborative research.) With Co-PI's H. Borko, H. Kupermintz, J. Frykholm (University of Colorado), S. Derry, M. W. Alibali, and E. Knuth (University of Wisconsin–Madison), and K. R. Koedinger (Carnegie Mellon).

Co-Principal Investigator, "Preparing Tomorrow's Teachers to use Technology" (PT3) Implementation grant issued by U. S. Dept of Education, Office of Post-Secondary Education (\$1,170,000 2000-2002, Award P342A000115) with Profs. M. Meloth and D. D. Peressini (PI).

Co-Principal Investigator, "Bridges to representational fluency: Grounding and abstraction in early algebra instruction" from the James S. McDonnell Foundation (\$771,000 Jun 1998 – May 2002) with K. R. Koedinger (PI) & M. W. Alibali.

Co-Principal Investigator, "Understanding informal algebra and bridging to symbolic algebra" from the James S. McDonnell Foundation (\$416,560 Jan. 1995 - Dec. 1997). With K. R. Koedinger (PI) and H. J. M. Tabachneck.

Principal Investigator, post-doctoral fellowship "Cognitive studies for educational practice" James S. McDonnell Foundation (Grant no. 91-18) under the supervision of Prof. L. B. Resnick, LRDC, University of Pittsburgh (Sept. 1991 to Aug. 1993).

## **Awards & Honors**

*Facilitators' Choice Award* for the 2020 STEM For All Video Showcase, "The Hidden Village: Mathematical Reasoning Through Movement." [Multiplex.videohall.com/presentations/1662](https://multiplex.videohall.com/presentations/1662)

*Vilas Distinguished Achievement Professor, University of Wisconsin-Madison, 2018*

*Fellow, International Society of the Learning Sciences, 2018*

*Hilldale Undergraduate/Faculty Research Fellowship Award, University of Wisconsin, 2015-16*

*Inductee, Teaching Academy*, University of Wisconsin, 2014.

*Exceptionality Designation*, Dept. of Educational Psychology, University of Wisconsin, 2008-2009.

*Outstanding Reviewer, Review of Educational Research*, American Educational Research Association, 2007.

*Distinguished Publisher's Award*, Theoretical and applied research in robotic vision and reasoning systems, Martin Marietta Denver Aerospace, 1986

## Books

1. **Nathan, M. J.** (2021). *Foundations of embodied learning: A paradigm for education*. Routledge. ISBN-13: 9780367349752 (hardback); 9780367349769 (paperback); 9781000430073 (ebook).
2. **Consensus Committee for the National Academies of Sciences, Engineering, and Medicine.** (2019). *Science and Engineering for Grades 6-12: Investigation and Design at the Center*. Washington, DC: The National Academies Press. doi.org/10.17226/25216.
3. Dwayne Day, Rapporteur & **The Planning Committee on Sharing the Adventure** (2015). *Sharing the Adventure with the Student: Exploring the Intersections of NASA Space Science and Education: A Workshop*. Space Studies Board; Division on Engineering and Physical Sciences; Board on Science Education; and the National Research Council. Washington DC: National Academies Press.
4. **Committee on Integrated STEM Education. National Academy of Engineering and National Research Council** (2014). *STEM Integration in K-12 Education: Status, Prospects, and an Agenda for Research*. Margaret Honey, Greg Pearson, and Heidi Schweingruber (Eds.). Washington, DC: The National Academies Press.
5. Rummel, N., Kapur, M., **Nathan, M. J.**, & Puntambekar, S. (Eds.) (2013a). *To See the World and a Grain of Sand: Learning across Levels of Space, Time, and Scale: Proceedings of the Tenth Computer Supported Collaborative Learning Conference (CSCL10), Volume I*. Madison, WI, USA: University of Wisconsin.
6. Rummel, N., Kapur, M., **Nathan, M. J.**, & Puntambekar, S. (Eds.) (2013b). *To See the World and a Grain of Sand: Learning across Levels of Space, Time, and Scale: Proceedings of the Tenth Computer Supported Collaborative Learning Conference (CSCL10), Volume II*. Madison, WI, USA: University of Wisconsin.

## Refereed Publications & Peer-Reviewed Conference Papers

(N.B. \* Student co-authors; + Postdoctoral fellow co-authors)

1. \*Godfrey, M., Rosser, A. A., Jung, S., Crandall, M., **Nathan, M. J.**, & Greenberg, J. A. (2021). Attending's instructional methods as exhibited during intraoperative takeovers. *Surgery*, 170(2), 446-453. [doi.org/10.1016/j.surg.2021.02.022](https://doi.org/10.1016/j.surg.2021.02.022)

2. \*Kim, D., Swart, M. I., \*Schenck, K., & **Nathan, M. J.** (2021, June). Grounded and Embodied Proof Production: Are Gestures and Speech Enough to Produce Deductive Proof? In E., de Vries, Y. Hod, & J. Ahn (Eds.) *Proceedings of the 15th International Conference of the Learning Sciences - ICLS 2021* (pp. 1109-1110). Bochum, Germany: International Society of the Learning Sciences.
3. \*Kirankumar, V., \*Sung, H., Swart, M., \*Kim, D., \*Xia, F., Kwon, O. H., **Nathan, M. J.**, & Walkington, C. (2021, June). Embodied transmission of ideas: Collaborative construction of geometry content and mathematical thinking. In C. E. Hmelo-Silver, B. De Wever, & J. Oshima (Eds.), *Proceedings of the 14<sup>th</sup> International Conference on Computer-Supported Collaborative Learning - CSCL 2021* (pp. 177-180). Bochum, Germany: International Society of the Learning Sciences.
4. \*Schenck, K. & **Nathan, M. J.** (2021, June). Exploring expanded notions of mathematical reasoning: Spatial systems, anxiety, and embodiment. In A. Wichmann, H. U. Hoppe, & N. Rummel (Eds.), *General Proceedings of the 1st Annual Meeting of the International Society of the Learning Sciences 2021* (pp. 113-114). Bochum, Germany: International Society of the Learning Sciences.
5. Walkington, C., Gravell, J., Velazque, J., He, T., Hickey, G., **Nathan, M. J.**, & Cuevas, A. (2021, June). Collaborative virtual learning in the shAR geometry simulation environment. In A. Wichmann, H. U. Hoppe, & N. Rummel (Eds.), *General Proceedings of the 1st Annual Meeting of the International Society of the Learning Sciences 2021* (pp. 17-20). Bochum, Germany: International Society of the Learning Sciences.
6. \*Xia, F., Swart, M. I., \*Kim, D., & **Nathan, M. J.** (2021, April). Eliciting predictive behaviors to support embodied mathematical cognition: Socially-distanced experimentation in the time of COVID-19. Paper presented at the 2021 Annual Meeting of the American Educational Research Association, San Diego, CA (virtual). AERA.
7. Walkington, C., **Nathan, M. J.**, \*Holcomb-Webb, K., & \*Wang, M. (2021, April). Collaborative creation of embodied geometry proofs for a motion capture game. Paper presented at the 2021 Annual Meeting of the American Educational Research Association, San Diego, CA (virtual). AERA.
8. Abrahamson, D., **Nathan, M. J.**, Williams–Pierce, C., Walkington, C., Ottmar, E. R., Soto, H., & Alibali, M. W. (2020). The future of embodied design for mathematics teaching and learning. *Frontiers in Education*, 5(147). [doi.org/10.3389/educ.2020.00147](https://doi.org/10.3389/educ.2020.00147)
9. \*Michaelis, J. E. & **Nathan, M. J.** (2020, April). A case study of enculturation practices that support emerging STEM interest in an out-of-school program. Paper presented at the 2020 Annual Meeting of the American Educational Research Association, San Francisco, CA.
10. **Nathan, M. J.**, Harrison, A., Smith, H., Ottmar, E., Abrahamson, D., & Williams-Pierce, C. (2020, October). Embodied Mathematical Imagination and Cognition (EMIC) Working Group. In Ana Isabel Sacristán & José Carlos Cortés (Eds.) (pp. 166-168), *Proceedings of the 42nd annual conference of the North-American chapter of the International Group for the Psychology of Mathematics Education (PME-NA 42)*. Mazatlán, Sinaloa, Mexico. [doi.org/10.51272/pmna.42.2020-12](https://doi.org/10.51272/pmna.42.2020-12)

11. **Nathan, M. J.**, \*Schenck, K., \*Vinsonhaler, R., Michaelis, J., +Swart, M., & Walkington, C. (2020). Embodied geometric reasoning: Dynamic gestures during intuition, insight, and proof. *Journal of Educational Psychology*. doi.org/10.1037/edu0000638
12. **Nathan, M. J.** & Swart, M. I. (2020). Materialistic epistemology lends design wings: Educational design as an embodied process. *Educational Technology Research and Development*, 1-30.  
  
*N. B. Special Issue on embodied cognition and technology for learning. T.J. Kopcha, Keri D. Valentine & Ceren Oca, Editors*
13. \*Schenck, K. E., \*Michaelis, J. E., Swart, M. I., \*Xia, F., **Nathan, M. J.**, & Walkington, C. A. (2020, April). Mathematical knowledge is embodied: Synergistic contributions of gesture and speech during geometry proof production. Paper presented at the 2020 Annual Meeting of the American Educational Research Association, San Francisco, CA.
14. \*Schenck, K. E. & **Nathan, M. J.** (2020, April). Connecting mathematics, spatial ability and spatial anxiety. Paper presented at the 2020 Annual Meeting of the American Educational Research Association, San Francisco, CA.
15. Hall, A., **Nathan, M. J.**, Swart, M., Fitzpatrick, S., Dolezalek, B., Correnti, R., Witherspoon, E., Matsumura, L. C., Walsh, M., Schunn, C., Stein, M. K., Nicholas, C., McClain, J., Rogers, M. P., Danish, J., Gibbons, L., Manz, E., Wilhelm, A., Bien, A., Kavanagh, S., Siy, E., Dutro, E., Ghouseini, H., Kazemi, E., Griesemer, C., Zivic, A., Edwards, K., Murzynski, C., Smith, J. F., Alzen, J. L., Passmore, C., Penuel, W. R., Reiser, B. J., Goldman, S., Ko, M., Herbst, P., Milewski, A., Ogan, A., Clarke, S., Gomoll, A., Zimmerman, J., Calvillo, J., & Gutierrez, K. (2020). Teachers learning to promote classroom discourse, equity, agency, and engagement. In Gresalfi, M. and Horn, I. S. (Eds.), *The Interdisciplinarity of the Learning Sciences, 14th International Conference of the Learning Sciences (ICLS) 2020*, Volume 4 (pp. 2151-2158). Nashville, Tennessee: International Society of the Learning Sciences. doi.dx.org/10.22318/icls2020.2151
16. +Swart, M. I., \*Schenck, K. E., \*Xia, F., Kim, D., Kwon, O. H., Walkington, C., & **Nathan, M. J.** (2020, October). Embodiment as a Rosetta Stone: Collective conjecturing in a multilingual classroom using a motion capture geometry game. In Ana Isabel Sacristán & José Carlos Cortés (Eds.) (pp. 2206-2214), *Proceedings of the 42nd annual conference of the North-American chapter of the International Group for the Psychology of Mathematics Education (PME-NA 42)*. Mazatlán, Sinaloa, Mexico. doi.org/10.51272/pmna.42.2020-382
17. Swart, M., \*Schenck, K., \*Xia, F., Kwon, O. H., **Nathan, M. J.**, \*Vinsonhaler, R., & Walkington, C. (2020). Grounded and embodied mathematical cognition for intuition and proof playing a motion-capture video game. In M. Gresalfi and I. S. Horn (Eds.), *The Interdisciplinarity of the Learning Sciences, 14th International Conference of the Learning Sciences (ICLS) 2020, Volume 1* (pp. 175-182). Nashville, Tennessee: International Society of the Learning Sciences. DOI: 10.22318/icls2020.175
18. \*Vest, N. A., +Fyfe, E. R., **Nathan, M. J.**, & Alibali, M. W. (2020). Learning from an avatar video instructor: The role of gesture mimicry. *Gesture*, 19(1), 128-155.
19. Walkington, C. A., **Nathan, M. J.**, & \*Wang, M. (2020, April). The effect of relevant directed arm motions on gesture usage and proving of geometry conjectures. Paper presented



at the 2020 Annual Meeting of the American Educational Research Association, San Francisco, CA.

20. Walkington, C., \*Wang, M. & **Nathan, M. J.** (2020). Collaborative gestures among high school students conjointly proving geometric conjectures. In *Proceedings of the 14th International Congress on Mathematics Education (ICME-14)*, Shanghai, China.  
  
*N. B. Proceedings is delayed and in modified format due to COVID-19.*
21. \*Xia, F., **Nathan, M. J.**, Swart, M. I., \*Schenck, K. E., & Kwon, O. H. (2020, April). Does Click Matter? The role of text and diagram on geometric reasoning and gesture production. Paper presented at the 2020 Annual Meeting of the American Educational Research Association, San Francisco, CA.
22. Alibali, M. W., **Nathan, M. J.**, Boncoddò, R., & \*Pier, E. (2019). Managing common ground in the classroom: teachers use gestures to support students' contributions to classroom discourse. *ZDM*, 51(2), 347-360.
23. **Nathan, M. J.**, \*Yeo, A., Boncoddò, R., Hostetter, A., & Alibali, M. W. (2019). Teachers' attitudes about gesture for learning and instruction. *Gesture*, 18:1, 31-56. [doi.org/10.1075/gest.00032.nat](https://doi.org/10.1075/gest.00032.nat)  
  
*N. B. 2019 publication date but did not come out till summer 2020.*
24. \*Pier, E. L., Walkington, C., +Clinton, V., +Boncoddò, R., \*Williams-Pierce, C., Alibali, M. W., & **Nathan, M. J.** (2019). Embodied truths: How dynamic gestures and speech contribute to mathematical proof practices. *Contemporary Educational Psychology*, 58, 44-57.
25. Walkington, C., \*Chelule, G., \*Woods, D., & **Nathan, M.J.** (2019). Collaborative gesture as a case of extended mathematical cognition. *Journal of Mathematical Behavior*. DOI: 10.1016/j.jmathb.2018.12.002
26. Walkington, C., **Nathan, M. J.**, \*Woods, D., & \*Chelule, G. (2019, April). Relationships between gesture beliefs, domain knowledge, and gesture usage in mathematics. Paper presented at the 2019 Annual Meeting of the American Educational Research Association, Toronto, Canada.
27. Walkington, C., \*Woods, D., **Nathan, M.J.**, \*Chelule, G., & \*Wang, M. (2019). Does restricting hand gestures impair mathematical reasoning? *Learning and Instruction*, 64, 101225.
28. +Fyfe, E. R., & **Nathan, M. J.** (2018). Making “concreteness fading” more concrete as a theory of instruction for promoting transfer. *Educational Review*, 1-20.
29. **Nathan, M. J.** (2018). Do the merits of the complex systems conceptual framework of learning extend to design-for-learning guidelines? In session: *Rising Above? Implications of Complexity for Theories of Learning*. In Kay, J. and Luckin, R. (Eds.) *Rethinking Learning in the Digital Age: Making the Learning Sciences Count, 13th International Conference of the Learning Sciences (ICLS) 2018, Volume 2* (pp. 1328-1334). London, UK: International Society of the Learning Sciences. doi.dx.org/10.22318/cscl2018.1328

30. **Nathan, M. J.**, Walkington, C., Vinsonhaler, R., Michaelis, J., McGinty, J., Binzak, J. V., & Kwon, O., H. (2018, April). Embodied account of geometry proof, insight, and intuition among novices, experts, and English language learners. Paper presented to the 2018 Annual Meeting of the American Educational Research Association, New York, NY.
31. **Nathan, M. J.** & Walkington, C. (2018). Insight Out: Embodied game play improves mathematical insight and proof. In session: Abrahamson, D., Andrade, A., Lindwall, O., Bakker, A., **Nathan, M. J.**, Walkington, C. A., Lindgren, R., Brown, D., Zohar, A. R., Levy, S. T., Danish, J., Maltese, A., Enyedy, N., Humburg, M., Saleh, A., Dahn, M., Lee, C., Tu, X., Davis, B., & Georgen, C. (2018). Moving Forward: In Search of Synergy Across Diverse Views on the Role of Physical Movement in Design for STEM Education. In Kay, J. and Luckin, R. (Eds.) *Rethinking Learning in the Digital Age: Making the Learning Sciences Count, 13th International Conference of the Learning Sciences (ICLS) 2018, Volume 2* (pp. 1243-1250). London, UK: International Society of the Learning Sciences. doi.org/10.22318/csc12018.1243
32. Ottmar, E. R., Melcer, E., Abrahamson, D., **Nathan, M. J.**, Fyfe, E., & Smith, C. (2018). Embodied mathematical imagination and cognition (EMIC) Working Group. In Hodges, T. E., Roy, G. J., & Tyminski, A. M. (Eds.). (2018). *Proceedings of the 40th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 1449-1458). Greenville, SC: University of South Carolina & Clemson University.
33. Pier, E. L., Brauer, M., Filut, A., Kaatz, A., Raclaw, J., **Nathan, M. J.**, Ford C. E., & Carnes, M. (2018). Low agreement among reviewers evaluating the same NIH grant applications. *Proceedings of the National Academy of Sciences* (PNAS), DOI: [10.1073/pnas.1714379115](https://doi.org/10.1073/pnas.1714379115)
34. Walkington, C., \*Chelule, G., \*Woods, D., & **Nathan, M. J.** (2018). Collaborative gesture as a case of distributed mathematical cognition. In Kay, J. and Luckin, R. (Eds.), *Rethinking Learning in the Digital Age. Making the Learning Sciences Count. Vol. 1* (pp. 552-559). *Proceedings of the 13th International Conference of the Learning Sciences*. London, UK: International Society of the Learning Sciences. doi.org/10.22318/csc12018.552
35. Walkington, C., Vinsonhaler, R., Michaelis, J., McGinty, J., Binzak, J. V., & Kwon, O. H., Swart, M., & **Nathan, M. J.** (2018) Kinecting geometric proof concepts using gestures. In Hodges, T. E., Roy, G. J., & Tyminski, A. M. (Eds.), *Proceedings of the 40th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (p. 1287). Greenville, SC: University of South Carolina & Clemson University.
36. Walkington, C., \*Woods, D., \*Chelule, G., & **Nathan, M. J.** (2018, April). Does restricting hand gesture impair mathematical reasoning? Paper presented to the *2018 Annual Meeting of the American Educational Research Association*. New York, NY.
37. Walkington, C., \*Woods, D., **Nathan, M. J.**, \*Chelule, G., & Wang, M. (2018). The effect of inhibiting hand gestures on mathematical reasoning. In Kay, J. and Luckin, R. (Eds.), *Rethinking Learning in the Digital Age. Making the Learning Sciences Count. Vol. 3* (pp. 1591-1592). *Proceedings of the 13th International Conference of the Learning Sciences*. London, UK: International Society of the Learning Sciences. doi.org/10.22318/csc12018.1591

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48. \*Williams-Pierce, C. \*Pier, E. L., Walkington, C., +Boncoddio, R., Clinton, V., Alibali, M. W., & **Nathan, M. J.** (2017). What we say and how we do: Action, gesture, and language in proving. *Journal for Research in Mathematics Education*, 48(3), 248-260.
49. Williams–Pierce, C., Walkington, C., Landy, D., Lindgren, R., Levy, S. T., **Nathan, M. J.**, & Abrahamson, D. (2017, June). Enabling and Understanding Embodied STEM Learning. In Smith, B. K., Borge, M., Mercier, E., and Lim, K. Y. (Eds.), *Making a Difference: Prioritizing Equity and Access in CSCL, 12th International Conference on Computer Supported Collaborative Learning (CSCL) 2017, Volume 2* (pp. 909-912). Philadelphia, PA: International Society of the Learning Sciences. ISBN (Electronic): 9780990355021
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51. Anasingaraju, S., Wu, M. L., Adamo-Villani, N., Popescu, V., Cook, S. W., **Nathan, M.**, & Alibali, M. (2016, November). Digital learning activities delivered by eloquent instructor avatars: scaling with problem instance. In *SIGGRAPH ASIA 2016 Symposium on Education* (p. 5). Association of Computing Machinery (ACM).
52. +Clinton, V., Alibali, M. W., & **Nathan, M. J.** (2016). Learning about posterior probability: Do diagrams and elaborative interrogation help? *The Journal of Experimental Education*, 84(3), 1-21. DOI: 10.1080/00220973.2015.1048847
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54. Fyfe, E. R. & **Nathan, M. J.** (2016, July). Connecting concrete and abstract representations: What is “concreteness fading” and how does it work? Fourth Annual Midwest Meeting on Mathematical Thinking (M3T). Madison, WI.
55. \*Michaelis, J. E., Clinton, V. E., Cooper, J. L., **Nathan, M. J.**, & Alibali, M. W. (2016, April). Cognitive principles for effective uses of visual information improve mathematics learning by encouraging deeper processing, In Symposium: Bridging research and practice: findings from the National Center on Cognition and Mathematics Instruction. Paper presentation to the 2016 Annual Meeting of the American Educational Research Association, Washington, DC.
56. \*Michaelis, J. E. & **Nathan, M. J.** (2016). Observing and measuring interest development among high school students in an out-of-school robotics competition (ASEE Paper ID #16242). Paper presentation to the American Society of Engineering Education ASEE 2016, New Orleans, LA: ASEE.

57. **Nathan, M. J.** (2016, July). Action-cognition transduction: An embodied account of transformational proof in mathematics. Fourth Annual Midwest Meeting on Mathematical Thinking (M3T). Madison, WI.
58. **Nathan, M. J.**, Ottmar, E., Abrahamson, D., Williams-Pierce, C., Walkington, C., & Nemirovsky, R. (2016, November). Embodied mathematical imagination and cognition (EMIC) Working Group. In the *Proceedings of the 38th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 1690-1697). Tucson, AZ: University of Arizona.
59. **Nathan, M. J.** & Walkington, C. (November, 2016). Design of a Video Game for Promoting Embodied Mathematical Reasoning. In the *Proceedings of the 38th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (p. 1558). Tucson, AZ: University of Arizona.
60. \*Pier, E. L., +Raclaw, J., Ford, C. E., & **Nathan, M. J.** (2016, April). Studying the study section: How collaborative decision making and videoconferencing impacts the grant peer review process. Paper presentation to the 2016 Annual Meeting of the American Educational Research Association, Washington, DC.
61. Walkington, C. A. & **Nathan, M. J.** (2016, April). Embodied learning on any device: Geometric proof in a motion-capture video game. Paper presentation to the 2016 Annual Meeting of the American Educational Research Association, Washington, DC.
62. Clinton, V. E., Morsanyi, K., Alibali, M. W., & **Nathan, M. J.** (2015, April). Learning about probability from text and tables: Do color coding and labeling through a user-interactive interface help? Paper presentation to the 2015 Annual Meeting of the American Educational Research Association, Chicago, IL.
63. Dunlosky, J., Rawson, K. A., Marsh, E. J., **Nathan, M. J.**, & Willingham, D. T. (2015/2013). What Works, What Doesn't. *Scientific American* (Special Issue "Your Inner Genius") *Special Editions Volume 23, Issue 5s*.
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64. \*Michaelis, J. & **Nathan, M. J.** (2015). The four-phase interest development in engineering survey. *Proceedings of the American Society of Engineering Education (ASEE) 2015* (Paper no. 11925; pp. 1-13). Seattle, WA: ASEE Publications.
65. \*Michaelis, J. E., & **Nathan, M. J.** (2015, April). The role of feedback in interest development in an out-of-school engineering setting. Paper presentation to the 2015 Annual Meeting of the American Educational Research Association, Chicago, IL.
66. **Nathan, M. J.** & Alibali, M. W. (2015, April). Effective instructional gestures: Design principles for virtual pedagogical agents. In session The Learning at Hand: Gesture Production in Virtual Pedagogical Agents. For the SIG-Advanced Technologies for Learning. Paper presentation to the 2015 Annual Meeting of the American Educational Research Association, Chicago, IL.
67. **Nathan, M. J.**, Alibali, M. W., Nemirovsky, R., Walkington, C., & Hall, R. (November, 2015). Embodied mathematical imagination and cognition (EMIC). In the *Proceedings of the*

- 37th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 1352-1359). East Lansing, MI: Michigan State University.
68. **Nathan, M. J.**, +Clinton, V. E., +Cooper, J. L., & Alibali, M. W. (2015, April). Now you don't: Visual attention for illustrations during mathematical lessons. In Symposium, Scaling Up Cognitive Learning Principles to Redesign a Mathematics Curriculum for Improved Learning. Paper presentation to the 2015 Annual Meeting of the American Educational Research Association, Chicago, IL.
  69. **Nathan, M. J.** & \*Martinez, C. V. J. (2015). Gesture as model enactment: The role of gesture in mental model construction and inference making when learning from text. *Learning: Research and Practice*, *1*(1), 4-37. DOI: 10.1080/23735082.2015.1006758
  70. \*Pier, E. L., Walkington, C. A., Boncoddio, R., +Clinton, V. E., & **Nathan, M. J.** (2015, April). Show and tell: Using students' speech to predict dynamic gesture production during proof. Paper presentation to the 2015 Annual Meeting of the American Educational Research Association, Chicago, IL.
  71. Walkington, C., Cooper, J., **Nathan, M. J.**, & Alibali, M. W. (November, 2015). The Effects of Visual Representations and Interest-Based Personalization on Solving Mathematics Story Problems. In the *Proceedings of the 37th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (p. 127). East Lansing, MI: Michigan State University.
  72. Walkington, C., +Clinton, V., Ritter, S. N., & **Nathan, M. J.** (2015). How readability and topic incidence relate to performance on mathematics story problems in computer-based curricula. *Journal of Educational Psychology*, *107*(4), 1051-1074. DOI: 10.1037/edu0000036
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  74. Alibali, M. W., **Nathan, M. J.**, Wolfgram, M. S., Church, R. B., \*Jacobs, S. A., \*Martinez, C. J., & Knuth, E. J. (2014). How teachers link ideas in mathematics instruction using speech and gesture: A corpus analysis. *Cognition and Instruction*. *32*(1), 65-100, DOI: 10.1080/07370008.2013.858161.  
  
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  76. +Lockwood, E., \*Yeo, A., \*Crooks, N., **Nathan, M. J.**, & Alibali, M. W. (2014). Teaching about confidence intervals: How instructors connect ideas using speech and gesture. In W. Penuel, S. A. Jurow, and K. O'Connor (Eds.), *Learning and Becoming in Practice:*

- Proceedings of the Eleventh International Conference of the Learning Sciences* (pp. 1042-1046). Boulder, CO: University of Colorado.
77. \*Michaelis, J. & **Nathan, M. J.** (2014). The role of feedback in interest development in an out-of-school engineering setting. In W. Penuel, S. A. Jurow, and K. O'Connor (Eds.), *Learning and Becoming in Practice: Proceedings of the Eleventh International Conference of the Learning Sciences* (pp. 1525-1526). Boulder, CO: University of Colorado.
78. **Nathan, M. J.** (2014, April). Modeling Activities in Integrated STEM Learning. Symposium presentation in "STEM Integration: Promises and Challenges," M. Gauvain (Organizer) to the 2014 Annual Meeting of the American Educational Research Association, Philadelphia, PA.
79. **Nathan, M. J.**, Walkington, C., +Boncoddio, R., \*Pier, E. L., \*Williams, C. C., & Alibali, M. W. (2014). Actions speak louder with words: The roles of action and pedagogical language for grounding mathematical proof. *Learning and Instruction*, 33, 182-193. DOI: 10.1016/j.learninstruc.2014.07.001
80. \*Pier, E. L., Walkington, C. A., +Clinton, V., +Boncoddio, R., and **Nathan, M. J.** (2014, April). Exploring computerized text analysis to predict the validity of students' proof construction. Paper presentation to the 2014 Annual Meeting of the American Educational Research Association, Philadelphia, PA.
81. \*Pier, E. L., Walkington, C., \*Williams, C., +Boncoddio, R., \*Waala, J., Alibali, M. W., & **Nathan, M. J.** (2014). Hear what they say and watch what they do: Predicting valid mathematical proofs using speech and gesture. In W. Penuel, S. A. Jurow, and K. O'Connor (Eds.), *Learning and Becoming in Practice: Proceedings of the Eleventh International Conference of the Learning Sciences* (pp. 649-656). Boulder, CO: University of Colorado.
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83. Walkington, C., +Boncoddio, R., \*Williams, C., **Nathan, M. J.**, Alibali, M. W., \*Simon, E., & \*Pier, E. L. (2014). Being mathematical relations: Dynamic gestures support mathematical reasoning. In W. Penuel, S. A. Jurow, and K. O'Connor (Eds.), *Learning and Becoming in Practice: Proceedings of the Eleventh International Conference of the Learning Sciences* (pp. 479-486). Boulder, CO: University of Colorado.
84. Alibali, M. W., **Nathan, M. J.**, Church, R. B., Wolfgram, M. S., \*Kim, S., & Knuth, E. J. (2013). Gesture and speech in mathematics lessons: Forging common ground by resolving trouble spots. *ZDM – International Journal on Mathematics Education*. 45, 425–440. DOI 10.1007/s11858-012-0476-0 (published online 1/31/13).
85. Alibali, M. W., \*Young, A. G., \*Crooks, N. M., \*Yeo, A., +Wolfgram, M. S., Ledesma, I. M., **Nathan, M. J.**, Church, R. B., & Knuth, E. J. (2013). Students learn more when their teacher has learned to gesture effectively. *Gesture*, 13(2), 210-233.

86. +Boncoddio R., \*Williams, C., \*Waala, J., Walkington, C., \*Pier, E., \*Dogan, M. F., **Nathan, M. J.**, & Alibali, M. W. (November, 2013). Gesture as a window to justification and proof. In M.V. Martinez & A.C. Superfine (Eds.), *Proceedings of the 35th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 229-236). Chicago, IL: University of Illinois-Chicago.
87. +Clinton, V., Alibali, M. W., & **Nathan, M. J.** (November, 2013). The effects of diagrams and questioning while reading on learning from a statistics lesson. In M.V. Martinez & A.C. Superfine (Eds.), *Proceedings of the 35th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 341-348). Chicago, IL: University of Illinois-Chicago.
88. +Clinton, V., Alibali, M. W., & **Nathan, M. J.** (November, 2013). Individual differences in calculating posterior probability: Do statistics education and math proficiency matter? In M.V. Martinez & A. C. Superfine (Eds.), *Proceedings of the 35th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (p. 374). Chicago, IL: University of Illinois-Chicago.
89. +Clinton, V., Alibali, M. W., & **Nathan, M. J.** (November, 2013). Why do diagrams increase learning from lessons? In M.V. Martinez & A. C. Superfine (Eds.), *Proceedings of the 35th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (p. 318). Chicago, IL: University of Illinois-Chicago.
90. +Clinton, V. E., +Cooper, J. L., Alibali, M. W. & **Nathan, M. J.** (2013, April). The Role of Contextual Illustrations in Problem-Solving Accuracy and Lesson-Text Comprehension. *Reciprocal relations between research and practice: how improving curricular materials led to new research questions*. Paper presentation to the Annual Meeting of the American Educational Research Association (San Francisco, CA).
91. +Cooper, J. L., +Clinton, V., \*Riggs, E. A., \*Brey, E., Alibali, M. W., & **Nathan, M. J.** (November, 2013). Contextual visual information in middle school problem solving: A puzzling situation. In M.V. Martinez & A. C. Superfine (Eds.), *Proceedings of the 35th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (p. 555). Chicago, IL: University of Illinois-Chicago.
92. \*Dogan, M.F., \*Williams, C.C., +Walkington, C., **Nathan, M. J.** (2013, March). Body-based examples when exploring conjectures: Embodied resources and mathematical proof. Research Pre-session of the 2013 National Council of Teachers of Mathematics Annual Meeting and Exposition (Denver, CO).
93. Dunlosky, J., Rawson, K. A., Marsh, E. J., **Nathan, M. J.**, & Willingham, D. T. (2013a). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest*, 14(1), 4-58.
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94. Dunlosky, J., Rawson, K. A., Marsh, E. J., **Nathan, M. J.**, & Willingham, D. T. (2013b). What Works, What Doesn't. *Scientific American Mind* (Feature article), 24(4), 46-53.



95. +Lockwood, E. N., \*Yeo, A., Alibali, M. W., & **Nathan, M. J.** (2013, April). Linking ideas in statistics instruction: Evidence from gesture and speech. Paper presentation to the Annual Meeting of the American Educational Research Association (San Francisco, CA).
96. **Nathan, M. J.**, & Sawyer, K. (2013, April). Learning Science and Research on Teaching: Handbook of Research on Teaching Symposium. Paper presentation to the Annual Meeting of the American Educational Research Association (San Francisco, CA).
97. **Nathan, M. J.**, \*Srisurichan, R., +Walkington, C., Wolfgram, M., \*Williams, C. & Alibali, M. W. (2013). Building cohesion across representations: A mechanism for STEM integration. *Journal of Engineering Education* (Special issue on representations in engineering education), 102(1), 77–116.
98. \*Pier, E., +Boncoddò, R., Alibali, M. W., and **Nathan, M. J.** (2013, April). Investigating the impact of coordinating STEM representations in digital electronics on learning. Paper presentation to the Annual Meeting of the American Educational Research Association (San Francisco, CA).
99. +Walkington, C., **Nathan, M. J.**, Alibali, M., \*Pier, L., +Boncoddò, R., & \*Williams, C. (2013, April). Projection as a mechanism for grounding mathematical justification in embodied action. Paper presentation to the Annual Meeting of the American Educational Research Association (San Francisco, CA).
100. \*Williams, C., \*Pier, E., Walkington, C., Alibali, M. W., **Nathan, M. J.**, \*Dogan, M. F., & +Boncoddò, R. (2013). Broadening what we perceive: An introduction to research methods for analyzing gesture and language. In M.V. Martinez & A. C. Superfine (Eds.), *Proceedings of the 35th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 1260-1263). Chicago, IL: University of Illinois-Chicago.
101. Alibali, M. W. & **Nathan, M. J.** (2012). Embodiment in mathematics teaching and learning: Evidence from learners' and teachers' gestures. *Journal of the Learning Sciences*. (Special Issue on Embodiment in Mathematics.), 21(2), 247-286. DOI: 10.1080/10508406.2011.611446.
102. Alibali, M. W., Wolfgram, W., \*Young, A. G., Church, R. B., Johnson, C. V., Jacobs, S. A., & **Nathan, M. J.** (2012, April). Linking Mathematical Ideas Multimodally Enhances Learning. Paper presentation to the American Educational Research Association annual meeting (Vancouver, BC).
103. \*Bem, J., \*Jacobs, S., Goldin-Meadow, S., Levine, S., Alibali, M., & **Nathan, M. J.** (2012, June). Gesture's benefit for instruction: Attention coordination or embodied cognition? Presented at Jean Piaget Society 42<sup>nd</sup> Annual Meeting (Toronto, Canada).
104. +Clinton, V., +Cooper, J., Alibali, M.W., & **Nathan, M. J.** (2012, Sept.). Integrating visual and verbal information in mathematics. Paper presented at the Society for Research in Educational Effectiveness (SREE) in Washington, D.C.
105. +Clinton, V., **Nathan, M. J.**, & Alibali, M.W. (November, 2012). The influence of visual representations on learning from lessons on functions. In L.R. Van Zoest, J.J. Lo, & J.L. Kratky (Eds), *Proceedings of the 34th Annual Conference of the North American Chapter of the International Group for the Psychology of Mathematics Education* (p. 122) Kalamazoo, MI.

106. +Cooper, J. L., **Nathan, M. J.**, +Clinton, V. E., \*Sidney, P., & Alibali, M. W. (2012, April). Design Principles for the Integration of Visual and Verbal Information in a Math Curriculum. Paper presentation to the American Educational Research Association annual meeting (Vancouver, BC).
107. \*Hattikudur, S., \*Prather, R., Asquith, P. Alibali, M. W., Knuth, E., & **Nathan, M. J.** (2012). Constructing graphical representations: Middle schoolers' intuitions and developing knowledge about slope and Y-intercept. *School Science and Mathematics*, 112(4), 230-240. DOI: 10.1111/J.1949-8594.2012.00138.X
108. **Nathan, M. J.** (2012). Rethinking formalisms in formal education. *Educational Psychologist*, 47(2), 125-148. DOI:10.1080/00461520.2012.667063.
109. **Nathan, M. J.**, \*Srisurichan, R., +Walkington, C., \*Williams, C., & Alibali, M. W. (2012, April). How STEM integration is produced and maintained in the high school engineering classroom. Paper presentation to the 2nd P-12 Engineering and Design Education Research Summit (Washington, DC).
110. \*Srisurichan, R., +Boncoddio, R., Ledesma, I., \*Pier, E., **Nathan, M. J.** & Alibali, M. W. (2012, July). Addressee gesture as a means to foster common ground in the classroom. In R. B. Church (chair), *Navigating the connections among mathematical representations: Exploring gesture's role during mathematical instruction*. Symposium presented at the 5th conference of the International Society for Gesture Studies, Lund, Sweden.
111. +Walkington, C. \*Srisurichan, R., **Nathan, M. J.**, \*Williams, C. & Alibali, M. W. (2012, April). Grounding mathematical justifications in concrete embodied experience: the link between action and cognition. Paper presentation to the American Educational Research Association annual meeting (Vancouver, BC).
112. \*Williams, C., +Walkington, C., +Boncoddio, R., \*Srisurichan, R., Pier, E., **Nathan, M. J.**, & Alibali, M. (2012). Invisible proof: The role of gestures and action in proof. In L. R. Van Zoest, J.-J. Lo, & J. L. Kratky (Eds.), *Proceedings of the 34th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 182-189). Kalamazoo, MI: Western Michigan University.
113. \*Yeo, A., \*Crooks, N. M., +Lockwood, E., Ledesma, I., Bergsabaken, J., Church, R. B., Knuth, E. J., **Nathan, M. J.** & Alibali, M. W. (2012, July). Does teachers' visual scaffolding affect students' learning? Connecting representations via gesture. In R. B. Church (chair), *Navigating the connections among mathematical representations: Exploring gesture's role during mathematical instruction*. Symposium presented at the 5th conference of the International Society for Gesture Studies, Lund, Sweden.
114. Alibali, M. W., **Nathan, M. J.**, \*Kim, S., \*Johnson, C. V., Wolfgram, M. S., Church, R. B., & Knuth, E. (2011, April). Teachers' visual scaffolding and student learning: effects of connecting representations via gesture. In session "Learning With Spatial, Embedded, and Embodied Representations." Paper presentation to the American Educational Research Association annual meeting (New Orleans).
115. +Cooper, J. L., +Clinton, V., \*Sidney, P., Alibali, M. W. & **Nathan, M. J.** (2011, October). *Visuals in mathematics problem solving: When are there benefits?* Poster presented at the biennial meeting of the Cognitive Development Society, Philadelphia, Pennsylvania.

116. Courter, S., \*Anderson, K., **Nathan, M. J.**, Phelps, L. A., Nathans-Kelly, T., Grohowski, C. N., McGlamery, T., \*Prevost, A., \*Stein, B., & \*Atwood, A. (2011, June). Moving towards the intended, explicit, and authentic: Addressing misalignments in engineering learning within secondary and university education. Special Session to the American Society of Engineering Education (ASEE 2011) Educational Research Methods (ERM) Division. (Paper no. AC 2011-1452). Vancouver, BC.
117. **Nathan, M. J.** (2011, May). Using contrasting cases and other cognitive principles to inform development of math and science interventions, for the 2011 Association for Psychological Science (APS) Annual Convention. (Washington, DC).
118. **Nathan, M. J.**, Alibali, M. W., Wolfgram, M., \*Srisuruchan, R., & \*Felton, M. (2011, April). Modal engagements in high school STEM classrooms: Tracking the ‘where’ and ‘what’ of mathematics across ecological contexts. In session “Diverse Perspectives on Embodied Learning: What’s So Hard to Grasp?” Paper presentation to the American Educational Research Association annual meeting (New Orleans).
119. **Nathan, M. J.**, Alibali, M. W., Wolfgram, M., \*Srisurichan, R., & +Walkington, C. (2011, May). Threading mathematics through symbols, pixels, sketches and wood: Tailoring high school STEM instruction to build cohesion across modal engagements. Paper presentation to the Annual Meeting of the Jean Piaget Society (Berkeley, CA).
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227. **Nathan, M. J.** (1985). Hypothesis generation in a theorem proving based pattern recognition system. *Proceedings of SPIE Symposium on Intelligent Robotics and Computer Vision* (pp. 170-176). Bellingham, WA: SPIE.

### Scholarly Book Reviews

228. \*Pier, E. L. & **Nathan, M. J.** (2016). A review of ‘Mathematics and the body: Material entanglements in the classroom.’ *Journal for Research in Mathematics Education*, 47(4), 423-427.
229. \*Felton, M. D. & **Nathan, M. J.** (2009). Exploring Sfard's commognitive framework of thinking as communicating: A review of ‘Thinking as Communicating: Human Development, the Growth of Discourses, and Mathematizing.’ *Journal for Research in Mathematics Education*, 40 (5), 571 – 576.
230. **Nathan, M. J.** (2007). Enriching the Brain: How to Maximize Every Learner's Potential (book review). *Science Education*, 91, 341-344.

231. **Nathan, M. J.** (2006). Reflecting on the role of the hand, head and soul of America: The mind at work. *Mind, Culture and Activity*, 13(1), 74-77.

### Book Chapters

232. **Nathan, M. J.** & Sawyer, K. (in press). Foundations of Learning Sciences. In K. Sawyer (Ed.). *The Cambridge Handbook of the Learning Sciences* (Third Edition) (pp. xx-xx). Cambridge, England, UK: Cambridge University Press. [N.B. 41 manuscript pages.]
233. \*Schenck, K., Walkington, C., & **Nathan, M. J.** (in press). Groups that move together, prove together: Collaborative gestures and gesture attitudes among teachers performing embodied geometry. In S. Macrine and J. Fugate (Eds.) *Movement matters: How embodied cognition informs teaching and learning* (pp. 131-145). MIT Press.
234. **Nathan, M. J.** & Alibali, M. W. (2021). An embodied theory of transfer of mathematical learning. In Charles Hohensee and Joanne Lobato (Eds.) *Transfer of Learning: Progressive Perspectives for Mathematics Education and Related Fields* (pp. 27-58). Springer.
235. Alibali, M. W. & **Nathan, M. J.** (2018). Embodied cognition in learning and teaching: Action, observation, and imagination. In F. Fischer, S. Goldman, C. Hmelo-Silver & P. Riemann (Eds.), *International Handbook of the Learning Sciences* (pp. 75-85). New York, NY: Routledge/ Taylor & Francis.
236. **Nathan, M. J.** (2017). One function of gesture is to make new ideas: Evidence for reciprocity between action and cognition. In R. B. Church, M. W. Alibali & S. D. Kelly, (Eds.) *Why gesture? How the hands function in speaking, thinking and communicating*. (pp. 175-196). Philadelphia, PA: John Benjamins Publishing Company. [doi.org/10.1075/gs.7.09nat](https://doi.org/10.1075/gs.7.09nat)
237. **Nathan, M. J.**, Alibali, M. W., & Church, R. B. (2017). Making and breaking common ground: How teachers use gesture to foster learning in the classroom. In R. B. Church, M. W. Alibali & S. D. Kelly, (Eds.) *Why gesture? How the hands function in speaking, thinking and communicating*. (pp. 285-316). Philadelphia, PA: John Benjamins Publishing Company. [doi.org/10.1075/gs.7.14nat](https://doi.org/10.1075/gs.7.14nat)
238. Clinton, V., Cooper, J.L., \*Michaelis, J., Alibali, M.W., & **Nathan, M.J.** (2017). Revising visuals based on instructional design principles: Effects on cognitive load and learning. In C. Was, F.J. Sansosti, & B.J. Morris (Eds.) *Eye-tracking technology applications in educational research*, (pp. 195-218). Hershey, PA: IGI Global.
239. **Nathan, M. J.**, Rummel, N., & Hay, K. E. (2016). Growing the Learning Sciences: Brand or big tent? Implications for graduate education. In M. A. Evans, M. J. Packer, and R. K. Sawyer (Eds.) *Reflections on the Learning Sciences*. (pp. 191-209). New York: Cambridge University Press. ISBN: 9781107070158.
240. **Nathan, M. J.** & Sawyer, K. (2014). Foundations of Learning Sciences. In K. Sawyer (Ed.). *The Cambridge Handbook of the Learning Sciences* (Second Edition) (pp. 21-43). Cambridge, England, UK: Cambridge University Press.
241. **Nathan, M. J.** (2014). Grounded Mathematical Reasoning. In L. Shapiro (Ed.). *The Routledge Handbook of Embodied Cognition* (pp. 171-183). New York: Routledge.

242. \*Prevost, A. C., **Nathan, M. J.**, Phelps, L. A., \*Atwood, A. K., \*Tran, N. A., \*Oliver, K., & \*Stein, B. (2014). Academic connections in precollege engineering contexts: The intended and enacted curricula of Project Lead the Way™ and beyond. In Strobel, J., Purzer, S. & Cardella, M. (Eds.) *Engineering in Pre-College Settings: Research into Practice* (pp. 211-230). West Lafayette, IN: Purdue University Press.
243. +Walkington, C. A., **Nathan, M. J.**, Wolfgram, M., Alibali, M. W., & \*Srisurichan, R. (2014). Bridges and barriers to constructing conceptual cohesion across modalities and temporalities: Challenges of STEM integration in the precollege engineering classroom. In Strobel, J., Purzer, S. & Cardella, M. (Eds.) *Engineering in Pre-College Settings: Research into Practice* (pp. 183-209). West Lafayette, IN: Purdue University Press.
244. Alibali, M. W., **Nathan, M. J.** & \*Fujimori, Y. (2011). Gestures in the classroom: What's the point? In N. L. Stein & S. W. Raudenbush (Eds.) *Developmental Cognitive Science Goes to School* (pp. 219-234). New York: Routledge.
245. **Nathan, M. J.**, & Alibali, M. W. (2011). How gesture use enables intersubjectivity in the classroom. In G. Stam & M. Ishino (Eds.), *Integrating gestures: The interdisciplinary nature of gesture* (pp. 257-266). Amsterdam: John Benjamins.
246. **Nathan, M. J.** (2010). Technology supports for acquiring mathematics. In: Penelope Peterson, Eva Baker, & Barry McGaw, (Editors), *International Encyclopedia of Education*. Vol. 8, pp. 172-183. Oxford: Elsevier.
247. **Nathan, M. J.**, \*Kim, S., & Eilam, B. (2009). Methodological considerations in the study of intersubjectivity among participants of a dialogic mathematics classroom. In Schwarz, B. B., Hershkowitz, R., & Dreyfus, T. (Eds.) *Transformation of knowledge through classroom interaction* (pp. 244-260). *New Perspectives on Learning and Instruction Book Series*. New York: Routledge.
248. **Nathan, M. J.** (2008). An embodied cognition perspective on symbols, grounding, and instructional gesture. In DeVega, M., Glenberg, A. M. & Graesser, A. C. (Eds.) *Symbols, Embodiment and Meaning: A Debate* (pp. 375-396). Oxford, England: Oxford University Press.
249. Alibali, M. W. & **Nathan, M. J.** (2007). Teachers' gestures as a means of scaffolding students' understanding: Evidence from an early algebra lesson. In Goldman, R., Pea, R., Barron, B. J., and Derry, S. (Eds.) *Video Research in the Learning Sciences* (pp. 349-365). Mahwah, NJ: Erlbaum.
250. **Nathan, M. J.** (2007). To disagree, we must also agree: How intersubjectivity structures and perpetuates discourse in a socially mediated mathematics learning environment. In B. B. Schwarz and T. Dreyfus (Eds.) *Proceedings from the Workshop on Guided Construction of Knowledge in Classrooms* (pp. 27-37). Hebrew University Jerusalem, Israel: Authors. Available at [http://escalate.org.il/construction\\_knowledge/eng\\_intro.htm](http://escalate.org.il/construction_knowledge/eng_intro.htm)
251. French, A. & **Nathan, M. J.** (2006). Under the microscope of research and into the classroom: Reflections on early algebra learning and instruction. In J. O. Masingila (Ed.) *Teachers Engaged in Research* (pp. 49-68). Greenwich, CT: Information Age Publishing.

252. **Nathan, M. J.** (2002). Mathematics Learning: Algebra. In James W. Guthrie (Ed.) *Encyclopedia of Education, Second Edition* (Vol. 5, pp. 1542-1545). New York: Macmillan Reference USA.
253. Cognition and Technology Group at Vanderbilt (1997). *The Jasper Project: Lessons in Curriculum, Instruction, Assessment, and Professional Development*. Mahwah, NJ: Erlbaum.
254. Cognition and Technology Group at Vanderbilt (1996). Looking at technology in context: A framework for understanding technology and educational research. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of Educational Psychology* (pp. 807-840). New York: MacMillan.
255. Schwarz, B. B., **Nathan, M.** & Resnick, L. B. (1996). Acquisition of meaning for arithmetic structure with the Planner. In S. Vosniadou, E. De Corte, R. Glaser, & H. Mandl (Eds.), *International Perspectives on the Design of Technology-Supported Learning Environments* (pp. 61-80). Hillsdale, NJ: Erlbaum.
256. **Nathan, M. J.** & Resnick, L. B. (1994). Less can be more: Unintelligent tutoring based on psychological theories and experimentation. In S. Vosniadou, E. De Corte, & H. Mandl (Eds.), *Technology-based Learning Environments: Psychological and Educational Foundations*, NATO ASI Series F, Computer and Systems Sciences, Vol. 137 (Sub-series on Advanced Educational Technology). (pp. 183-192). New York: Springer Verlag.
257. **Nathan, M. J.** (1991). A simple learning environment improves mathematical reasoning. In H. S. Nwana (Ed.), *Mathematical Intelligent Learning Environments* (pp. 162-186). Intellect Books: Oxford. (Reprinted from *Intelligent Tutoring Media*. 2(3&4). 101-111.)

### Invited Presentations

1. **Nathan, M. J.** (2021, May). Discussion of “*Foundations of Embodied Learning: A Paradigm for Education*,” to Montclair State University, Dr. Steven Greenstein’s doctoral seminar on advanced topics in mathematics education research. May 18, 2021.
2. **Nathan, M. J.** (2021, Jan.) Scale-down methodology: Scaling-up educational innovation. Talk to Santa Fe Institute: Education, Equity & Technology, January 19, 2021.
3. **Nathan, M. J.** (2020, Oct.). The Future of Embodied Design for Mathematics Teaching and Learning. Virtual panel presentation hosted by embodiedmathematics.com. [EMIC Virtual #2]
4. **Nathan, M. J.** (2020, July). Scale-down methodology: A complex systems approach to scaling up educational innovation. Presentation to the Teachers-as-Learners Program, James S. McDonnell Foundation.
5. **Nathan, M. J.** (2020, Jun) Embodied mathematical imagination and cognition: Professional development for undergraduate mathematics instructors. University of Northern Colorado.
6. **Nathan, M. J.** (2020, Jun). Instructional gestures for classrooms and on-line mathematics learning in the time of COVID-19. Panel presentation to the EMIC community and public. [www.embodiedmathematics.com/emic-virtual](http://www.embodiedmathematics.com/emic-virtual)

7. **Nathan, M. J.**, Swart, M. I, Xia, F., & Kim, D. (2020, May) It's the gesture that counts: How gestures contribute to effective instruction. The annual Teaching and Learning Symposium: Lifelong Learning (and Unlearning) as Teachers. University of Wisconsin-Madison
8. **Nathan, M. J.** (2020, May) The Crisis of Complexity in Educational Design. Summit on AI and Educational Futures. University of Wisconsin-Madison.
9. **Nathan, M. J.** (2019, Oct.) Educating the embodied mind. Educational Psychology Department Colloquium.
10. **Nathan, M. J.** (2018, Feb.) Children's invented solution strategies as a source of bridging instruction for introductory algebra. University of Maryland.
11. **Nathan, M. J.** (2018, Feb.) Integrating STEM into the K-12 classroom. Michigan State University.
12. **Nathan, M. J.** (2017, June) Publishing in the Learning Sciences: A journal writers' workshop. At the international conference on Computer Supported Collaborative Learning, Phila., PA.
13. **Nathan, M. J.** (2017, May) Reconnecting the body to mathematics learning and instruction. Michigan State University, School of Education, East Lansing, MI.
14. **Nathan, M. J.** (2017, May) Using our bodies to do and understand mathematics. East High School Mathematics Dept., Madison, WI.
15. **Nathan, M. J.** (2017, April) Work-Life balance for faculty in education research. American Educational Research Association, Division C Graduate Student Seminar, San Antonio, TX.
16. **Nathan, M. J.** (2016, October). Keynote: The future of the Learning Sciences. Talk given to the Inaugural Learning Sciences Graduate Student (LSGS) Conference, University of Illinois-Chicago.
17. **Nathan, M. J.** (2016, May). Action-Cognition Transduction: A proposed mechanism for enhancing mathematical intuition during proof production. Invited talk to University of Chicago - Center for Gesture Sign and Language (CGSL), Chicago, IL.
18. **Nathan, M. J.** (2016, February). Research in Mathematics Education, Research-to-Practice Conference Keynote: "Integrating STEM into the K-12 mathematics classroom," Southern Methodist University, Dallas, TX.
19. **Nathan, M. J.** (2015, February). AAAS Presidential Invited Session: Human Mathematical Abilities - From Intuition to the Classroom and Back. American Association for the Advancement of Science (Section J, Psychology). With J. L. McClelland (Organizer), E. S. Spelke, P. J. Kellman, and B. D. McCandliss. San Jose, CA.
20. **Nathan, M. J.** (2015, February). Body-based resources when reading-to-learn in science: gestures and model enactment for stem literacy. Learning and the Brain Conference. San Francisco, CA.
21. **Nathan, M. J.** (2014, November). Plenary speaker, "The Science of Learning." International Mind, Brain and Education Society (IMBES), Fort Worth, TX.



22. **Nathan, M. J.** (2014, October). Rising to the challenges of integrated STEM education: A response from the field of learning sciences. Colloquium series “Greater than the Sum of its Parts? Integrated Approaches to STEM Education in PreK-16,” University of Delaware School of Education.
23. **Nathan, M. J.** (2014, October). Keynote to the Virginia Military Institute: Leading your students to make connections in integrative STEM. Workshop on “Engineering Ingenuity.”
24. **Nathan, M. J.** (2014, May). Embodiment in mathematics teaching and learning: A view from students’ and teachers’ gestures. Invited talk to the Learning Sciences Lab (LSL) at the National Institute of Education (NIE) of Singapore.
25. **Nathan, M. J.** (2014, March). The Role of Formalisms in Mathematical Reasoning and Education. Latin American School for Education, Cognitive and Neural Sciences, Punta del Este, Uruguay.
26. **Nathan, M. J.** (2013, October). The Role of Gestures in Inference Making and the Enactment of Mental Models. University of Chicago, Dept. of Psychology. (Host: Susan Goldin-Meadow)
27. **Nathan, M. J.** (2013, May). If we are 'wired' to learn, then why do we often struggle with learning? Founders’ Day Keynote Presentation. Wisconsin Alumni Association (Washington County), University of Wisconsin.
28. **Nathan, M. J.** (2013, April). Embodied Cognition: What It Means to Know and Do Mathematics. Keynote presentation to the National Council of Teachers of Mathematics (NCTM) Annual Meeting (Denver, CO)
29. Edwards, L., **Nathan, M. J.**, & Nemirovsky, R. (2013, March). Embodied cognition and mathematical reasoning: Panel discussion for the Research Pre-Session and the Annual Meeting of the National Council of Mathematics Teachers (Denver).
30. **Nathan, M. J.** (2013, March). The Transition from Arithmetic to Algebraic Reasoning: The Role of Language and Action. The 3<sup>rd</sup> Latin American School for Education, Cognitive and Neural Sciences (Ilha de Comandatuba, Bahia, Brazil).
31. **Nathan, M. J.** (2013, Jan). STEM Education in the Classroom: Rising to the Challenges. Keynote Address for the STEM Education Initiative, Institute for the Promotion of Teaching Science and Technology (IPST), Ministry of Education, Bangkok, Thailand.
32. **Nathan, M. J.**, (2012, May). Scaling Down Educational Research on Mathematical Learning and Instruction. University of Indiana, Learning Sciences Spring Colloquium Series.
33. Pearson, G., McGrath, E., **Nathan, M. J.**, & Sanders, M. (2012, April). Panel discussion: Developing a research agenda for iSTEM: Update on a National Academies Study. Second P-12 Engineering and Design Education Research Summit, Washington, D.C.
34. Bruer, J. T., Klahr, D., Yaron, D., & **Nathan, M. J.** (2012, March). Panel presentation and open discussion: A bridge not-too-far: Cognitive neuroscience and education. The 2<sup>nd</sup> Latin American School for Education, Cognitive and Neural Sciences, El Calafate, Argentina.

35. **Nathan, M. J.** (2012, March). The Transition from Arithmetic to Algebraic Reasoning: The Role of Language and Action. The 2<sup>nd</sup> Latin American School for Education, Cognitive and Neural Sciences, El Calafate, Argentina.
36. **Nathan, M. J.** (2012, February). Gesture as Model Enactment. Department of Psychology. University of California-Santa Barbara.
37. **Nathan, M. J.** (2011, October). STEM Education and the Learning Sciences. Presentation to Educational Testing Services, Princeton, New Jersey.
38. **Nathan, M. J.** (2011, April). Taking the Research to the Classroom: Reframing the Challenges. Presentation to the Oklahoma Education Forum with the Oklahoma Association of Colleges of Teacher Education and State Education Leaders. Topic: Teacher Effectiveness: Using Research to Improve Student Learning. Sponsored by Edvance Research, Inc. Oklahoma City, OK.
39. **Nathan, M. J.** (2011, March). The Transition from Arithmetic to Algebraic Reasoning. The Latin American School for Education, Cognitive and Neural Sciences, Universidad de Chile, San Pedro De Atacama, Chile.
40. **Nathan, M. J.** (2010, May). Rising to the challenge of STEM education: Implications for Teaching. Presentation to the Region 11 (Minnesota) Math and Science Teacher Academy, University of Minnesota.
41. **Nathan, M. J.** (2010, April). What Is Engineering Practice and How Do Students Learn It? Presentation to the University of Wisconsin-Madison College of Engineering.
42. Halverson, E., & **Nathan, M. J.** (2010, April). Curriculum Design: The Backwards Design Process. Presentation to the University of Wisconsin-Madison School of Medicine and Public Health Annual "Medical Education Day."
43. **Nathan, M. J.** (2010, February). Rising to the challenge of STEM education. Keynote address to the opening ceremony of the University of Minnesota STEM Education Center, College of Education and Human Development.
44. **Nathan, M. J.** (2010, January). Conducting Multidisciplinary Research in Engineering Education. Presentation to the Multidisciplinary Program in Education Sciences, Learning Sciences Program, School of Education, Northwestern University.
45. **Nathan, M. J.** (2009, February). Understanding and cultivating algebraic reasoning. Lawrence University (Appleton, WI) Science Hall Colloquium Series, with co-sponsorship from the Education Department.
46. **Nathan, M. J.** (2008, February). Expert Blind Spot in teacher cognition. Presentation to the UTeach Discovery Learning Speaker Series, University of Texas at Austin.
47. **Nathan, M. J.** (2007, December). Gesture and materialistic epistemologies in reasoning and scientific discovery. Presentation to the Center for Advanced Studies–Behavior Sciences, Palo Alto, CA.

48. **Nathan, M. J.** (2007, June). Scaling up through knowledge accumulation. Presentation to the National Science Foundation, Arlington, VA.
49. **Nathan, M. J.** (2007, March). Expert Blind Spot in teacher cognition. Presentation to the Cognitive Psychology Brown Bag Series, University of Wisconsin-Madison.
50. **Nathan, M. J.** (2007, February). How intersubjectivity structures and perpetuates discourse in a socially mediated mathematics learning environment. Presentation to the Workshop on Guided Construction of Knowledge in Classrooms at Hebrew University Jerusalem, Israel. Hosted by B. B. Schwarz and T. Dreyfus.
51. **Nathan, M. J.** (2007, January). To disagree, we must also agree: How intersubjectivity structures and perpetuates discourse in a mathematics classroom. Presentation to the University of Haifa School of Education, Mount Carmel, Haifa, Israel.
52. **Nathan, M. J.** (2007, January). Expert Blind Spot in teacher cognition. Presentation to the University of Haifa Mathematics Education Program, Mount Carmel, Haifa, Israel.
53. **Nathan, M. J.** (2006, December). To disagree, we must also agree: How intersubjectivity structures and perpetuates discourse in a mathematics classroom. Presentation to the University of Wisconsin Learning Sciences Colloquium.
54. **Nathan, M. J.** (2006, June). Learning sciences research at the University of Wisconsin. Presentation to the WCER 10-year Review Panel. Wisconsin Center for Education Research, University of Wisconsin, Madison, WI.
55. **Nathan, M. J.** (2006, May). Learning science and the science of learning, Wisconsin Symposium on Human Biology, University of Wisconsin, Madison, WI.
56. **Nathan, M. J.** (2006, March). Research in the U. S. on learning and teaching in mathematics and science. Invited talk to the Research Institute of Science Education at Guangxi Normal University, China. Hosted by Prof LUO Xingkai, Prof of Physics and Director of the Research Institute of Science Education.
57. **Nathan, M. J.,** (2005, December). Symbols and grounding in instructional settings. Presentation to “Symbols, Embodiment, and Meaning: A Workshop and Debate.” December 16-18, 2005, University of La Laguna, Tenerife, Spain. Hosted by: Manuelo DeVega, Art Glenberg, and Art Graesser.
58. **Nathan, M. J.,** (2005, October). Teachers’ use of grounded communication. Presentation to the School of Education, University of Massachusetts-Amherst. Hosted by Prof. John Clement.
59. **Nathan, M. J.,** (2005, September). Further results supporting the transition from arithmetic to algebraic reasoning. Poster presentation at the Interagency Education Research Initiative (IERI) Meeting, Washington, DC.
60. **Nathan, M. J. & Halverson, E.** (2005, June). How Students Learn: Thinking, Teaching and Instructional Design. Presentation to the University of Wisconsin-Madison Teaching Academy.

61. **Nathan, M. J.**, (2004, September). Supporting the transition from arithmetic to algebraic reasoning. Poster presentation at the Interagency Education Research Initiative (IERI) Meeting, Washington, DC.
62. **Nathan, M. J.** (2003, June). Technology's *other* role in SMET education: How technology design and use can support science and mathematics education (and why we tend to dismiss such approaches). School of Education and Social Policy, Northwestern University.
63. **Nathan, M. J.** (2003, February). Expert Blind Spot in teacher cognition. University of Illinois-Chicago, Cognitive Psychology Department.
64. **Nathan, M. J.** (2003, February). The formal and the physical: Contrasting views of conceptual development in science learning. University of Wisconsin—Madison Developmental Psychology Brown Bag Series.
65. **Nathan, M. J.** (2002, December). Discussant for “What do we know and need to know about facilitated online learning for teacher professional development.” (Sharon Derry, Chair). Wisconsin Center for Education Research at the University of Wisconsin—Madison.
66. **Nathan, M. J.** (2002, October). Discussion of ‘Teacher education and technology use within the STEP Project’. (Cindy Hmelo-Silver & Sharon Derry, Chairs). Invited discussant for the *International Conference on the Learning Sciences*. (Seattle).
67. **Nathan, M. J.**, Eisenberg, M., Schick, B. (2001, November). The evolution of a theory of manipulatives design intended to cultivate abstract reasoning in mathematics: A multidisciplinary conversation. Part of the “Converging on Cognition, University of Colorado Institute of Cognitive Science.
68. **Nathan, M. J.** (1995, November). Comprehension processes during mathematical reasoning: What it means for classroom and computer-based learning environments. Presentation to the Cognitive Science and Technology Seminar Series, University of Northern Colorado, Greeley, CO.
69. **Nathan, M. J.** (1995, October). Comprehension processes during mathematical reasoning. Presentation to the Institute of Cognitive Science, University of Colorado.
70. **Nathan, M. J.** (1993, August). Toward a comprehension-based model of problem-solving competence. German Research Center for Artificial Intelligence (DFKI), Kaiserslautern, Germany.
71. **Nathan, M. J.** (1992, November). Situation models as a vehicle for sense-making. The Artifacts and Sense-Making Group, University of California Berkeley Graduate School of Education.
72. **Nathan, M.** (1992, January). Can we assess the assessments? Presentation to The New Standards Project Advisory Board Meeting on Language Arts (San Francisco).
73. **Nathan, M. J.** (1990, April). A comprehension-based approach to learning and instruction. Invited Address to the American Educational Research Association, 1990 Annual Meeting (AERA Division C). Co-presenter with W. Kintsch, B. Britton and S. Mannes. Boston, MA.

74. **Nathan, M. J.** (1989, June). A theory of problem comprehension. Presentation to The University of Bern, Switzerland, Department of Educational Psychology.
75. **Nathan, M.** (1985, March). Robotic vision: Theory and engineering applications. Presentation to the Colorado School of Mines, Department of Engineering.
76. **Nathan, M. J.** (1985, November). Machine vision and machine knowledge. University of Colorado (Denver), Department of Mathematics (Prof. H. Greenberg).

### **Paper and Panel Presentations at Professional Meetings (unprinted)**

1. **Nathan, M. J.** (2019, May). Embodied Meaning & Abstraction in Mathematics: Looming Questions. Presentation to National Science Foundation Synthesis and Design Workshop: The Future of Embodied Design for Mathematical Imagination and Cognition (May 20-22, 2019). Madison, WI.
2. Alibali, M. W., **Nathan, M. J.**, Popescu, V. & \*Yeo, A. (2016, July). Effective Instructional Gestures: Design Principles for Virtual Pedagogical Agents. Symposium presentation to the International Society for Gesture Studies (ISGS) Seventh International Conference. Paris, France.
3. **Nathan, M. J.** (2016, July). Symposium Organizer: Gesture production in virtual pedagogical agents. Symposium presentation to the International Society for Gesture Studies (ISGS) Seventh International Conference. Paris, France.
4. **Nathan, M. J.** & Church, R. B. (2016, July). Instructional gestures can resolve the fundamental tension between making and breaking common ground during classroom discourse Oral presentation to the International Society for Gesture Studies (ISGS) Seventh International Conference. Paris, France.
5. Alibali, M. W., \*Yeo, A., +Lockwood, E., \*Crooks, N., & **Nathan, M. J.** (2014, July). How instructors connect ideas using speech and gesture: Evidence from statistics lessons. Thematic Panel presented at the Sixth conference of the International Society for Gesture Studies (ISGS), San Diego, CA.
6. \*Donovan, A., +Boncoddio, R., \*Williams, C. C., Walkington, C., \*Pier, E. L., \*Waala, J., **Nathan, M. J.**, & Alibali, M. W. (2014, July). Action, gesture and abstraction in mathematical learning. Thematic Panel presented at the Sixth conference of the International Society for Gesture Studies (ISGS), San Diego, CA.
7. **Nathan, M. J.** & +Boncoddio, R. (2014, July). Teachers' attitudes and beliefs about the utility of gestures in classroom learning and instruction. In Teachers' Gestures in Instruction: Attitudes, Behavior, and Research Approaches. Thematic Panel presented at the Sixth conference of the International Society for Gesture Studies (ISGS), San Diego, CA.
8. **Nathan, M. J.** (2013, April). Session Chair: *Reasoning and Learning in Engineering and Computer Science Education*. Paper presentation to the Annual Meeting of the American Educational Research Association (San Francisco, CA).

9. **Nathan, M. J.** (2011, April). Using cognitive science to understand why, for whom, under what conditions interventions succeed or fail. Chair and presentation to the American Educational Research Association annual meeting (New Orleans).
10. **Nathan, M. J.**, & Vandell, D. (2011, April). So you want to be a peer reviewer: Learning to review annual meeting papers and enhancing annual meeting quality. Workshop for the American Educational Research Association annual meeting (New Orleans).
11. \*Kim, S. & **Nathan, M. J.** (2010, August). Gestures reveal thinking-for-speaking patterns in high and intermediate proficiency English language learners. Twentieth Anniversary Meeting of the Society for Text & Discourse (Chicago).
12. **Nathan, M. J.** (2010, August). How professional development changes high school STEM teachers' beliefs. P-12 Engineering and Design Education Research Summit, 2010 (Seaside, OR). Institute for P-12 Engineering Research and Learning, Purdue, University.
13. **Nathan, M. J.** & \*Johnson, C. V. (2010, August). The relation of situation models to gesture production when learning from a scientific text. Twentieth Anniversary Meeting of the Society for Text & Discourse (Chicago).
14. **Nathan, M. J.** & \*Johnson, C. V. (2010, June). Drawing inferences: How gestures and speech convey students' mental models of dynamic processes depicted in scientific drawings. In Ainsworth, S., & **Nathan, M. J.** (chairs) Learning about dynamic systems by drawing. International Conference of the Learning Sciences 2010 (Chicago).
15. **Nathan, M. J.**, Rummel, N., & Hay, K. E. (2010, June). Growing the Learning Sciences: Brand or Big Tent? Implications for Graduate Education. International Conference of the Learning Sciences 2010 (Chicago).
16. **Nathan, M. J.** (2010, June). Discussant for "Social construction of mathematical meaning through collaboration and argumentation" (Baruch Schwarz, Organizer & Chair). International Conference of the Learning Sciences 2010 (Chicago).
17. Alibali, M. W., Church, R. B., **Nathan, M. J.**, Knuth, E. J., Wolfgram, M. S., \*Jacobs, S. A., \*Hostetter, A., & \*Johnson, C. V. (2009, April). How teachers link mathematical ideas in instructional communication. In the Symposium "Can Findings From Developmental Science Transform Instruction and Improve Education Outcomes?" (Chair: Elizabeth R. Albro) 2009 Society for Research in Child Development (SRCD) Biennial Meeting, Denver, CO.
18. \*Hattikudur, S., Asquith, P. S., \*Kim, S., Knuth, E. J., **Nathan, M. J.**, & Alibali, M. W. (2009, April). Representational fluency in middle school: A look at curriculum and student performance. Poster presentation for 2009 Society for Research in Child Development (SRCD) Biennial Meeting, Denver, CO.
19. \*Jacobs, S., Church, R. B., Johnson, C., \*Kim, S., Wolfgram, M. S., Alibali, M. W. & **Nathan, M. J.** (2009, October). *How teachers link mathematical ideas in classroom instruction*. Poster presented at the biennial meeting of the Cognitive Development Society, San Antonio, Texas.
20. \*Jacobs, S. A., Church, R. B., **Nathan, M. J.**, Knuth, E. J., Wolfgram, M. S., & Alibali, M. W. (2009, April). How teachers use representational gestures in the classroom to teach algebraic

- concepts. Poster presentation for 2009 Society for Research in Child Development (SRCD) Biennial Meeting, Denver, CO.
21. **Nathan, M. J.** (2009, October). Discussant for “Understanding Knowledge Change: Investigations on How Children Learn Mathematics and Literacy Skills.” Cognitive Development Society 2009 annual meeting (San Antonio, TX).
  22. **Nathan, M. J.** (2009, April). Chair for the symposium “The role of concrete examples in learning math: Resolving some paradoxes” (with presenters Ken Koedinger, Martha Alibali, Jennifer Kaminski & Vladimir Sloutsky). 2009 Society for Research in Child Development (SRCD) Biennial Meeting, Denver, CO.
  23. **Nathan, M. J.** (2009, April). Discussant for the symposium “Cognitive Underpinnings of Complex Mathematics Skills: Longitudinal Investigations.” (Chair: Kerry Lee) 2009 Society for Research in Child Development (SRCD) Biennial Meeting, Denver, CO.
  24. **Nathan, M. J.** (2009, April). Chair for the Working Group “Cognitive Science and Education.” American Educational Research Association annual meeting, San Diego, CA.
  25. **Nathan, M. J.** & Alibali, M. W. (2009, May). Grounding and action in an embodied approach to mathematical teaching, learning and communicating. Presentation to the Embodied Mathematics Advisory Board, Madison, WI.
  26. **Nathan, M. J.** & \*Johnson, C. V. (2009, April). Gestures and mental models. Poster presented to the American Educational Research Association annual meeting, San Diego, CA.
  27. **Nathan, M. J.** (2008, June). The role of visual scaffolding in students' mathematics learning: Evidence from early algebra. Poster presentation to the Third Annual Research Conference of the US Department of Education-Institute of Educational Sciences, Washington, DC.
  28. **Nathan, M. J.** (2008, March). Discussant for “Math education meets gesture studies: How mathematics education adapts gesture studies to its own purposes,” presented to the American Educational Research Association annual meeting. New York.
  29. **Nathan, M. J.** (2008, March). Discussant for “Mapping ‘Geography of Opportunity’ in a large-scale randomized experiment on enhancing mathematics with technology,” presented to the American Educational Research Association annual meeting. New York.
  30. **Nathan, M. J.** (2008, March). Chair for “Embodiment for Education,” (Arthur Glenberg, Presenter) presented to the American Educational Research Association annual meeting. New York.
  31. **Nathan, M. J.** (2008, March). Chair for “Tangible media and mathematical imagination,” (Ricardo Nemirovsky, Presenter) presented to the American Educational Research Association annual meeting. New York.
  32. Alibali, M. W., & **Nathan, M. J.** (2007, June). A symposium entitled “Mechanisms by which Gestures Contribute to Establishing Common Ground: Evidence from Teaching and Learning” presented to the International Society for Gesture Studies (ISGS) Third International Conference. Evanston, IL.

33. \*Bieda, K. & **Nathan, M. J.** (2007, June). Going beyond: What gesture shows us about students' notions of graphs. Poster presentation to the International Society for Gesture Studies (ISGS) Third International Conference. Evanston, IL.
34. \*Hattikudur, S., \*Prather, R. W., Asquith, P., Knuth, E., **Nathan, M. J.**, & Alibali, M. W. (2007, April). Graphing slope and intercept in middle school. Poster presented at the Biennial Meeting of the Society for Research in Child Development, Boston, Massachusetts.
35. **Nathan, M. J.** (2007, April). Discussant for Symposium entitled "Using qualitative research methods to understand engaged learning in online communities" presented to the American Educational Research Association annual meeting. Chicago, IL.
36. **Nathan, M. J.** (2007, April). Chair of "The nature and role of tasks that foster learning in mathematics teacher education." Symposium presented to the American Educational Research Association annual meeting. Chicago, IL.
37. **Nathan, M. J.** & Alibali, M. W. (2007, June). Giving a hand to the mind: Gesture enables intersubjectivity in classroom. In a symposium entitled "Mechanisms by which Gestures Contribute to Establishing Common Ground: Evidence from Teaching and Learning" presented to the International Society for Gesture Studies (ISGS) Third International Conference. Evanston, IL.
38. Woods, D., **Nathan, M. J.**, & \*Bieda, K. & (2007, June). "Data session on Transana use for qualitative and quantitative gesture analysis" presented to the International Society for Gesture Studies (ISGS) Third International Conference. Evanston, IL.
39. \*Jackson, K. & **Nathan, M. J.** (2006, May). Boolean logic and qualitative research. Paper presented to the Session on "The Ethics of Embodiment" at The Second International Congress of Qualitative Inquiry. University of Illinois, Urbana-Champaign, IL.
40. **Nathan, M. J.** (2006, June). Discussion of "Epistemic games and scaffolding." Presentation to the International Conference of the Learning Sciences. University of Indiana, Bloomington, IN.
41. **Nathan, M. J.** & Knuth, E. (2006, April). Jim Kaput's legacy and impact on mathematics education, learning technology and educational reform. Chair and Organizer of Symposium for the American Educational Research Association annual meeting. San Francisco, CA.
42. **Nathan, M. J.** (2005, April). Discussant for "Advanced Technologies for Learning," Presentation to the American Educational Research Association annual meeting. Montreal, Canada.
43. **Nathan, M. J.** (2005, April). Discussant for "Attending to student thinking in mathematics teaching," Presentation to the American Educational Research Association annual meeting. Montreal.
44. **Nathan, M. J.** & \*Bieda, K. (2005, May). Revealing students' understanding of graphs through gesture and metaphor. Paper presented to the STAAR (Supporting the Transition from Arithmetic to Algebraic Reasoning) annual meeting. Estes Park, CO.



45. **Nathan, M. J.** & \*Jackson, K. (2005, April). The impact of Boolean operators on tool use: an embodied cognition perspective. Presentation to The Second Conference on Teaching Qualitative Methods University of Wisconsin, Madison, WI.
46. **Nathan, M. J.** & \*Kim, Sunae. (2005, May). Representational fluency. Paper presented to the STAAR (Supporting the Transition from Arithmetic to Algebraic Reasoning) annual meeting. Estes Park, CO.
47. **Nathan, M. J.** & \*Kim, Suyeon. (2005, May). How teacher mitigated feedback fosters classroom learning. Paper presented to the STAAR (Supporting the Transition from Arithmetic to Algebraic Reasoning) annual meeting. Estes Park, CO.
48. **Nathan, M. J.** (2004, April). Chair and Organizer of Symposium: Supporting middle school teachers to assist students make the transition from arithmetic to algebraic reasoning. American Educational Research Association annual meeting. San Diego, CA.
49. **Nathan, M. J.** (2002, April). Discussion of “The many facets of algebra.” Presentation to the American Educational Research Association annual meeting. New Orleans, LA.
50. **Nathan, M. J.** (2002, April). Discussion of “Collaborative technologies: A European perspective.” Presentation to the American Educational Research Association annual meeting. New Orleans, LA.
51. **Nathan, M. J.** (2000, April). Session Chair and Organizer: : Teachers crafting their own professional development for technology in the content areas. Presentation to the American Educational Research Association annual meeting. New Orleans, LA.
52. **Nathan, M. J.** (1999, April). The teaching and learning of early algebra at the middle school level: A 3-year review. Chair of Symposium for the American Educational Research Association annual meeting. Montreal, Canada.
53. **Nathan, M. J.** (1995, April). A discussion on “The Multimedia Journal Article” format as a new technology for reporting research and evaluation projects (panel chair, organizer, and presenter). American Educational Research Association (AERA) annual meeting. (with J. Hawkins, B. J. Hood, R. Hall, L. Erlbaum, & E. Soloway).
54. **Nathan, M. J.** (1994, January). How many situation models? Presentation to the Winter Text Conference. Jackson Hole, WY.
55. **Nathan, M. J.** (1993, January) Assessing and improving comprehension of mathematical story problems. Presentation to the Winter Text Conference. Jackson Hole, WY.
56. **Nathan, M. J.** (1993, August). A comparative analysis of learning environment design: The case of mathematical word problem solving (panel chair and presenter). Presentation to AI & Education annual meeting (Edinburgh, UK).
57. **Nathan, M. J.** (1993, August). European Association For Research on Learning and Instruction (EARLI). "Inference-making during word problem solving." (Aix-en-Provence, France).

58. **Nathan, M. J.** & Resnick, L. B.. (1992, July). Less can be more. Presentation to the NATO Advanced Study Institute (ASI) on the Psychological and Educational Foundations of Technology-Based Learning Environments (Crete, Greece).
59. **Nathan, M. J.** (1988, April). Animating algebra word problems. Presentation to the Rocky Mountain Psychological Association Conference. Snowbird, UT.
60. Greenberg, H. J. & **Nathan, M. J.** (1986, October). Object decomposition for collision avoidance. Presentation to the ORSA/TIMS Joint National Meeting. Miami, FL.

### Technical Reports & White Papers

1. **Nathan, M.J.**, Williams-Pierce, C., Walkington, C., Abrahamson, D., Ottmar, E., Soto, H., & Alibali, M.W. (2021). *Embodied Design for Mathematical Imagination and Cognition*. In Rapid Community Report Series. repository.isls.org/handle/1/6852
2. **Nathan, M. J.**, Williams-Pierce, C., Walkington, C., Abrahamson, D., Ottmar, E., Soto, H., & Alibali, M. W. (2019). *The Future of Embodied Design for Mathematical Imagination and Cognition*. Available at [circlcenter.org/events/synthesis-design-workshops/](http://circlcenter.org/events/synthesis-design-workshops/)
3. **Nathan, M. J.**, Rittle-Johnson, B., & Fyfe, E. (2016). Translational Research at the Intersection of Cognitive Science and Education. For the James S. McDonnell Foundation.

*NB. This provided the intellectual basis for the JSMF research grant program "Teachers as Learners."*

4. Pier, E. L., Raclaw, J., Ford, C. E., & **Nathan, M. J.** (2015). Studying the study section: How group decision making in person and via videoconferencing affects the grant peer review process. WCER Working Paper Series, no. 2015-06. Wisconsin Center for Education Research: Madison, WI. Available at [http://www.wcer.wisc.edu/publications/workingpapers/Working\\_Paper\\_No\\_2015\\_06.pdf](http://www.wcer.wisc.edu/publications/workingpapers/Working_Paper_No_2015_06.pdf)
5. **Nathan, M. J.**, Alibali, M. W., \*Masarik, D. K., \*Stephens, A. C., & Koedinger, K. R. (2010). Enhancing middle school students' representational fluency: A classroom-based study. WCER Working Paper Series no, 2010-9. Wisconsin Center for Education Research: Madison, WI. Available at [www.wcer.wisc.edu/Publications/workingPapers/Working\\_Paper\\_No\\_2010\\_09.pdf](http://www.wcer.wisc.edu/Publications/workingPapers/Working_Paper_No_2010_09.pdf)
6. \*Tran, N. A., \*Nathan, A. B., & **Nathan, M. J.** (2010). Hand Matching vs. Propensity Score Matching: An Empirical Comparison of Results From a Quasi-Experiment. WCER Working Paper Series no, 2010-7. Wisconsin Center for Education Research: Madison, WI. Available at [http://www.wcer.wisc.edu/Publications/workingPapers/Working\\_Paper\\_No\\_2010\\_07.pdf](http://www.wcer.wisc.edu/Publications/workingPapers/Working_Paper_No_2010_07.pdf)
7. Alibali, M. W., \*Brown, A. N., \*Stephens, A. C., \*Kao, Y. S., & **Nathan, M. J.** (2009). Middle School Students' Conceptual Understanding of Equations: Evidence From Writing Story Problems. WCER Working Paper No. 2009-3. Wisconsin Center for Education Research: Madison, WI. Available at [www.wcer.wisc.edu/Publications/workingPapers/Working\\_Paper\\_No\\_2009\\_03.pdf](http://www.wcer.wisc.edu/Publications/workingPapers/Working_Paper_No_2009_03.pdf)

8. **Nathan, M. J., \*Kim, S., & \*Grant, T. (2009).** Instituting change in classroom discourse structure: Human and computer-based motif analyses. WCER Working Paper Series WCER Working Paper Series no, 2009-1. Wisconsin Center for Education Research: Madison, WI. Available at [http://www.wcer.wisc.edu/publications/workingPapers/Working\\_Paper\\_No\\_2009\\_01.pdf](http://www.wcer.wisc.edu/publications/workingPapers/Working_Paper_No_2009_01.pdf)
9. **\*Grant, T. & Nathan, M. J.. (2008).** Students' conceptual metaphors influence their statistical reasoning. WCER Working Paper Series no. 2008-5. Wisconsin Center for Education Research: Madison, WI. At <http://www.wcer.wisc.edu/Publications/workingPapers/papers.php>
10. **Nathan, M. J. & \*Kim, S. (2007).** Regulation of teacher elicitations and the impact on student participation and cognition. WCER Working Paper Series no. 2007-04. Wisconsin Center for Education Research: Madison, WI. Available at [www.wcer.wisc.edu/publications/workingPapers/Working\\_Paper\\_No\\_2007\\_04.php](http://www.wcer.wisc.edu/publications/workingPapers/Working_Paper_No_2007_04.php).
11. **Nathan, M. J., \*Kim, S. & Eilam, B. (2006).** To disagree, we must also agree: How intersubjectivity structures and perpetuates discourse in a mathematics classroom. WCER Working Paper Series no. 2006-3. Wisconsin Center for Education Research: Madison, WI. At [http://www.wcer.wisc.edu/Publications/workingPapers/Working\\_Paper\\_No\\_2006\\_6.pdf](http://www.wcer.wisc.edu/Publications/workingPapers/Working_Paper_No_2006_6.pdf)
12. **Nathan, M. J. & \*Jackson, K. (2006).** Boolean classes and qualitative inquiry. WCER Working Paper Series no. 2006-3. Wisconsin Center for Education Research: Madison, WI. Available at [http://www.wcer.wisc.edu/Publications/workingPapers/Working\\_Paper\\_No\\_2006\\_3.pdf](http://www.wcer.wisc.edu/Publications/workingPapers/Working_Paper_No_2006_3.pdf)
13. **Nathan, M. J. & \*Bieda, K. N. (2006).** Middle school students' use of speech and gesture in pattern generalization tasks involving graphs: Evidence that bounded views influence performance. WCER Working Paper Series no. 2006-2. Wisconsin Center for Education Research: Madison, WI. Available at [www.wcer.wisc.edu/Publications/workingPapers/Working\\_Paper\\_No\\_2006\\_2.pdf](http://www.wcer.wisc.edu/Publications/workingPapers/Working_Paper_No_2006_2.pdf)
14. **Nathan, M. J. (2005).** Rethinking formalisms in formal education. WCER Working Paper Series no. 2005-11. Wisconsin Center for Education Research: Madison, WI. Available at [http://www.wcer.wisc.edu/Publications/workingPapers/Working\\_Paper\\_No\\_2005\\_11.pdf](http://www.wcer.wisc.edu/Publications/workingPapers/Working_Paper_No_2005_11.pdf)
15. **Nathan, M. J. & Eilam, B. (2005).** Visual display and co-expressivity as students strive for intersubjectivity in a spatial reasoning task. WCER Working Paper Series no. 2005-10. Wisconsin Center for Education Research: Madison, WI. Available at [http://www.wcer.wisc.edu/Publications/workingPapers/Working\\_Paper\\_No\\_2005\\_10.pdf](http://www.wcer.wisc.edu/Publications/workingPapers/Working_Paper_No_2005_10.pdf)
16. **Nathan, M. J. (2003).** Confronting teachers' beliefs about algebra development: Investigating an approach for professional development. Institute of Cognitive Science Technical Report no. 03-04. Boulder, CO: The University of Colorado.
17. **Nathan, M. J. & Petrosino, A. J. (2003).** Expert blind spot among preservice mathematics educators. Institute of Cognitive Science Technical Report no. 03-02. Boulder, CO: The University of Colorado. Available at <http://ics.colorado.edu/techpubs/pdf/03-02.pdf>
18. **Nathan, M. J., \*Masarik, D. K., \*Stephens, A. C., Alibali, M. W., & Koedinger, K. R. (2001).** Enhancing middle school students' representational fluency: A classroom-based study.

- Technical Report no. 01-05. Boulder, CO: The University of Colorado. Available at <http://ics.colorado.edu/techpubs/pdf/01-05.pdf>
19. **Nathan, M. J.** & Kalmon, S. (2001). Teachers crafting their own professional development for educational technology: The WorkingShops Working Shops Model. Institute of Cognitive Science Technical Report no. 01-04. Boulder, CO: The University of Colorado. Available at <http://ics.colorado.edu/techpubs/pdf/01-04.pdf>
  20. **Nathan, M. J.** (2001). Implicit views of mathematical development within algebra textbooks: Implications for educational reform. Institute of Cognitive Science Technical Report no. 01-03. Boulder, CO: The University of Colorado. Available at <http://ics.colorado.edu/techpubs/pdf/01-03.pdf>
  21. **Nathan, M. J.**, \*Long, S. D., & Alibali, M. W. (2000). The symbol precedence view of mathematical development: An analysis of the rhetorical structure of algebra textbooks. Institute of Cognitive Science Technical Report no. 00-07. Boulder, CO: The University of Colorado. Available at <http://ics.colorado.edu/techpubs/pdf/00-07.pdf>
  22. **Nathan, M. J.** & Robinson, C. (2000). Considerations of Learning & Learning Research: Revisiting the "Media Effects" Debate. Institute of Cognitive Science Technical Report no. 00-06. Boulder, CO: The University of Colorado. Available at <http://ics.colorado.edu/techpubs/pdf/00-06a.pdf>
  23. **Nathan, M. J.**, Koedinger, K. R., and Alibali, M. W. (2000). Expert blind spot: When content knowledge and pedagogical content knowledge collide. Institute of Cognitive Science Technical Report no. 00-05. Boulder, CO: The University of Colorado. Available at <http://ics.colorado.edu/techpubs/pdf/00-05.pdf>
  24. **Nathan, M. J.**, and Koedinger, K. R. (1999). Investigating the origins of teachers' beliefs of students' algebra development. Institute of Cognitive Science Technical Report 99-04. Boulder, CO: The University of Colorado. Available at <http://ics.colorado.edu/techpubs/pdf/99-05.pdf>
  25. **Nathan, M. J.** & Koedinger, K. R. (1999). Teachers' and researchers' beliefs about algebra development. Institute of Cognitive Science Technical Report no. 99-04. Boulder, CO: The University of Colorado. Available at <http://ics.colorado.edu/techpubs/pdf/99-04.pdf>
  26. **Nathan, M. J.**, and Koedinger, K. R. (1999). Teachers' judgments about algebra problem difficulty. Institute of Cognitive Science Technical Report 99-03. Boulder, CO: The University of Colorado. Available at <http://ics.colorado.edu/techpubs/pdf/99-03.pdf>
  27. **Nathan, M. J.**, Koedinger, K., and Tabachneck, H. T. (1996). Difficulty factors in arithmetic and algebra: The disparity of teachers' beliefs and students' performances. Institute of Cognitive Science Technical Report 96-06. Boulder, CO: The University of Colorado.
  28. Koedinger, K., **Nathan, M. J.** & Tabachneck, H. T. (1995). Understanding Informal Algebra and Bridging to Symbolic Algebra: First year report to the James S. McDonnell Foundation program for Cognitive Studies in Educational Practice. (Grant no. JSMF 95-11). Pittsburgh, PA: Author.

29. Lewis, A. B. & **Nathan, M. J.** (1991). A framework for improving students' comprehension of word arithmetic and word algebra problems. Institute of Cognitive Science Technical Report no. 91-05. Boulder, CO: The University of Colorado. Available at [ics.colorado.edu/techpubs/pdf/91-05.pdf](http://ics.colorado.edu/techpubs/pdf/91-05.pdf)
30. Lewis, A. B., **Nathan, M. J.**, & Birnbaum, L. (1991). A framework for improving students' comprehension of word arithmetic and word algebra problems. In *Proceedings of the International Conference on the Learning Sciences* (pp. 305-314). Association for the Advancement of Computing in Education Charlottesville, VA.
31. **Nathan, M. J.** Sparks, R., & Wolff, A. S. (1991). Anatomy and autopsy of an intelligent tutor: The WITS system from Bellcore. U S West Science and Technology Research Report.
32. **Nathan, M. J.**, Kintsch, W., & Young, E. (1990). A theory of algebra word problem comprehension and its implications for unintelligent tutoring systems. Institute of Cognitive Science Technical Report no. 90-02. Boulder, CO: The University of Colorado. Available at <http://ics.colorado.edu/techpubs/pdf/90-02.pdf>
33. **Nathan, M. J.**, Kintsch, W., & Lewis, C. (1988). Tutoring Algebra Word Problems. Institute of Cognitive Science Technical Report no. 88-12. Boulder, CO: The University of Colorado. Available at <http://ics.colorado.edu/techpubs/pdf/88-12.pdf>

### Other Scholarly Contributions

**Nathan, M. J.** (2008). *Handbook for AERA Division C Program Chairs*. Madison, WI: Author.

Work referenced in U. S. Patent #5808912 “Method for dimensional weighing utilizing point determination.” U. S. Patent Issued on September 15, 1998 to Daniel F. Dlugos and Earl B. Holtz (Pitney Bowes Inc.)

### Curriculum and Learning Environment Development

TECHNOLOGIES FOR EMBODIED CONCEPTUAL REASONING (2016-Date) – The wide accessibility of sensors and algorithms for processing real-time body movement has led to the design of a new class of educational technology that can elicit directed actions among individuals and small groups in ways that advance their conceptual understanding of advanced concepts such as geometric proof. An example is *The Hidden Village*. [Multiplex.videohall.com/presentations/1662](http://Multiplex.videohall.com/presentations/1662)

GROUNDING AND EMBODIED LEARNING (2014-Date) – Meaningful learning include nonverbal, body-based ways of knowing and processes that can operate outside of conscious awareness. This has implications for the design of learning, teaching, and assessment.

STEM CAREER DEVELOPMENT (2012-Date) – How do people find jobs in the digital age, and what role does their educational experience play, especially in STEM fields? The line of inquiry investigates the growing use of online resources for early career development (“What do I want to be when I grow up), adult job attainment, software analytics, and curriculum and simulation design to understand and improve the how people find suitable employment.

GROWING THE LEARNING SCIENCES (2010-Date) – I examine the common and varied approaches to Learning Sciences graduate education from existing programs worldwide and explore the tensions within interdisciplinary education and trade-offs between adherence to a common core (maintaining a “brand”) or a broadly inclusive model (forming a “big tent”).

GESTURE USE IN STEM INSTRUCTION (2006-Date) – This program explores methods by which teachers and animated pedagogical agents can use gestures to enhance the instruction and learning of abstract ideas in mathematics and engineering contexts.

PREPARATION FOR A CAREER IN EDUCATIONAL RESEARCH (2005-Date) – Graduate students need mentoring to explore and develop the knowledge and skills needed for emerging doctoral students to establish productive careers in educational research, spanning educational psychology, educational policy, educational leadership, social foundations, and curriculum and instruction.

NOVEL OUTPUT DEVICES FOR SMET (2002-2004) – Student activities and teacher professional development program to promote the design and construction of physical artifacts for science, mathematics, engineering and technology (SMET) education for undergraduates, high school, and middle school students that utilize novel output devices such as laser cutters.

REPRESENTATIONAL FLUENCY (2000-2002) – A nine-week unit that includes classroom activities, teaching methods (“Bridging Instruction for Seventh and Eighth Grade Algebra”) and assessment instruments for cultivating flexible uses of formal algebra-level representations. Taught two consecutive years.

WORKINGSHOPS (1995-99) – An integrated, in-school staff development program that brings teams of high school teachers, school of education faculty, and cognitive science researchers (in psychology and computer science) to promote self-directed professional development in areas of educational technology, state standards, and curriculum reform.

EARLY ALGEBRA CURRICULUM (1995-2000) – A twelve-week unit that includes classroom activities, teaching methods (“Bridging Instruction for Sixth Grade Algebra”) and assessment instruments for cultivating algebraic reasoning and uses of symbolic representations at the sixth grade level.

SMART TOOLS (1994-95) – Computer tools to support use of formal representations and simulations in complex, quantitative problem solving.

THE ADVENTURES OF JASPER WOODBURY (1993-95) – Video-based narrative tools for complex, collaborative mathematical problem solving in geometry and algebra.

ANIMATE (1988-1996) – An unintelligent tutoring system for integrating quantitative and verbal (text-based) reasoning in service of solving algebra level story problems.

## **Teaching**

### **UNIVERSITY OF WISCONSIN**

*Inductee, Teaching Academy, University of Wisconsin, April, 2014.*

ED PSY 533: Thinking, Feeling and Learning. Seminar for clinical psychology doctoral students in school psychology, counseling psychology and rehabilitation psychology required for APA licensure requirements in cognition, affect and neuroscience. (Previously Ed Psych 795-002) Fall 2014-2021.

ED PSY 795 & ED PSY 796: Introduction to Learning Sciences I & II (two-semester sequence). Academic years 2008-09, 2009-10, 2010-2011, 2012-2013.

EPD 654 / InterL&S701 / InterCALs 875 / Ed Psych 711 The College Classroom Course (Part of the University of WI CIRTl Certificate Program). Fall 2006, 2008, 2013. Theory and practice of undergraduate education.

ED C&I 916 / ED PSY 711: Doctoral Research Program Pro-seminar (two-semester sequence). 2005-07.

ED PSY 711 Epistemologies of Mathematics and Science. Symposium on advanced topics, including: Embodied cognition. Fall 2004, Spring 2006.

ED PSY 711 Embodied Cognition. Symposium on advanced topics, including: Embodied cognition. Spring 2008, Fall 2011, Spring 2012.

#### UNIVERSITY OF COLORADO

EDUC 4112 Educational Psychology and Adolescent Development (BA/Post-BA Secondary teacher education section)

EDUC 5705 Theories of Learning and Development (MA elementary teacher education section)

EDUC 6318 Psychological Foundations of Education (MA/PhD section; *cross-listed for Cognitive Science certification*)

EDUC 6318 Psychological Foundations of Education (MA Secondary teacher education section)

EDUC 6338 Cognitive Processes in Education: Central conceptual structures (*Cross-listed for Cognitive Science certification*)

EDUC 6338 Cognitive Processes in Education: Mathematical cognition (*Cross-listed for Cognitive Science certification*)

EDUC 6505 Readings and Research in Cognitive Science (*Cross-listed as Computer Science 7762/EDUC 6505/LING 7762/PHIL 7310/PSYCH 7762*)

EDUC 8358 Doctoral Seminar: Human Learning. A critical look at learning and technology (*Cross-listed for Cognitive Science certification*)

EDUC 8358 Doctoral Seminar: Human Learning. Theoretical and methodological issues in classroom-based research for mathematics and science learning (*Cross-listed for Cognitive Science certification*)

#### VANDERBILT UNIVERSITY

Cognitive Processes in Education, Fall, 1994 (Co-taught with Prof. John Bransford).

## **National and International Professional Service Activities**

### *National Academies*

National Academies of Science/National Research Council. Consensus committee member, “Engaging Middle and High School Students in Science and Engineering: New Approaches to Investigation and Design,” 2017-2018.

National Academy of Sciences (NAS) Space Studies Board and National Research Council (NRC) Board on Science Education - Planning committee for *Sharing the Adventure with the Student: Exploring the Intersections of NASA Space Science and Education* (2014-2015).

National Academy of Engineering and the National Research Council (NAE/NRC) Committee on Integrated STEM Education (2011-2014).

### *Offices Held in Professional Societies*

International Society of the Learning Sciences (ISLS) Committee Chair, Early Career Award (inaugural), 2019 to date.

International Society of the Learning Sciences (ISLS) Editorial Board member, *The Journal of the Learning Sciences*. June 2015 to date

American Society for Engineering Education (ASEE), Advisory Board to the Editor, *Journal of Engineering Education*. 2015 to date

International Society of the Learning Sciences (ISLS) Conferences Committee member. June 2013 to 2019

Graduate student mentor - AERA Division C Graduate Student Seminar. Dr. Kelly Rodgers, Chair. 2015

Graduate student mentor - AERA Division C Graduate Student Seminar. Dr. Jennifer Cromley, Chair 2012

American Educational Research Association (AERA). Annual Meeting Policies and Procedures (AMPP) Committee. Chair-designate 2008, and Chair 2009-2011

International Society of the Learning Sciences (ISLS) Founding officer - Secretary/Treasurer. 2002-2005

### *Editorial Board Member*

*The Journal of the Learning Sciences*. Associate Editor/Editorial Board member June 2015 to date.



*American Educational Research Journal: Teaching, Learning, and Human Development section.* Editorial Board member Oct. 2011 to 2015

*Journal for Research in Mathematics Education (JRME)*, Editorial Panel Member (NCTM), 2011-2014

*Journal of Pre-College Engineering Education Research (JPEER)*. Editorial Board member (inaugural). 2010-date

*Review of Educational Research*. Editorial board member. American Educational Research Association (AERA). 2009-2015

*Journal of Educational Psychology*. Advisory Editor. American Psychological Association (APA). 2008-2015

*Cognition and Instruction*. Editorial board member. Lawrence Erlbaum Associates. 2006-date

*The International Journal of Applied Intelligence*. Editorial board member, Kluwer Academic. Past member

National Institutes of Health (NIH), "AIDS and related research" (SBIRs). Standing Editorial Board member (Dr. Gilbert W. Meier, Chair). Past member

#### *Conference Program Committee Member*

Computer-Supported Collaborative Learning (CSCL) 2018 in London, England.

American Educational Research Association (AERA) 2014 (San Francisco), Section Chair for Learning and Instruction—Engineering Education and Computer Science Education (Division C, Section 1e.

American Educational Research Association (AERA) 2013 (San Francisco), Section Chair for Learning and Instruction—Engineering Education and Computer Science Education (Division C, Section 1e. Note 2013 was the fledgling year for this section).

Cognitive Science Society Annual Meeting 2011 (Boston, MA). Publicity Committee chair and Member of the Program Committee.

American Educational Research Association (AERA) 2009 (San Diego), 2010 (Denver), 2011 (New Orleans). Ex-Officio Member of the Program Committee.

Society for Text and Discourse 2010 (Chicago). Member of the Program Committee.

Cognitive Science Society Annual Meeting 2010 (Portland, OR). Publicity Committee chair and Member of the Program Committee.

American Educational Research Association (AERA) 2009 (San Diego). Ex-Officio Member of the Program Committee.

Cognitive Science Society Annual Meeting 2009 (Amsterdam). Publicity Committee chair and Member of the Program Committee.

American Educational Research Association (AERA) 2008 (New York City). Program Chair (Division C).

Cognitive Science Society Annual Meeting 2008 (Washington, DC). Publicity Committee chair and Member of the Program Committee.

Cognitive Science Society Annual Meeting 2007 (Nashville, TN). Publicity Committee co-chair and Member of the Program Committee.

American Educational Research Association (AERA) 2006 (San Francisco). Section Chair for Learning and Instruction—Mathematics (Division C, Section 3).

International Conference on the Learning Sciences (ICLS), 2004 (Santa Monica, CA). Member of Program Committee

Computer-Supported Collaborative Learning 2002 (Boulder, CO). Member of Program Committee

International Conference on Cognitive Science 2001 (Beijing). Member of Program Committee and Symposium Chair “Cognitive Science in Education.”

Session Chair and Program Committee member for The Society of Photo-Optical and Instrumentation Engineers' Cambridge Symposium on “Recent Advances in Intelligent Robotic Systems,” 1986-1988, Cambridge, MA.

#### *Advisory Board Member/Committee Member*

Chair, James S. McDonnell Foundation (JSMF) *Teachers as Learners* (Tal) program (2017 to date).

Advisory Board Member, Stanford University College of Engineering, PATHS – Pathways from School to Work. Advising on data collection, analysis and interpretation of data from a longitudinal study of undergraduate engineering students from college into the workforce, with policy recommendations for national engineering education and advising.

Advisory Board Member for INSPIRE (Purdue's Institute for P-12 Engineering Research and Learning), Purdue University (Summer 2012 to date).

External Evaluator for Carnegie Mellon “Learning with Multiple Graphical Representations in a Complex, Real-world domain: Intelligent Software Tutors for Fractions” project (NSF-REESE). (2009 to 2015).

Advisory Board Member for University of Maryland “Connected Chemistry” project (NSF funded).

“CoMPASS: Integrating Digital Text in Design-based Science Classrooms,” studies ways to provide a close coupling of hands-on activities and reading from informational text so that students access, evaluate, and interpret scientific information, and apply it to their ongoing exploration of physical phenomena. Funded by IERI (NSF, Dept of Ed-IES and NIH-NICHHD, 2004-2009).

“Algebra for All Project” addressing teacher professional development that focuses on research-based pedagogical practices, the accommodations and modifications necessary to support the success of all students, and increased mathematical content knowledge through curricular previews

for both special educators and regular educators. Submitted by University of Colorado-Denver and National Institute for Urban School Improvement for funding consideration to Office of Special Education and Rehabilitative Services, U S Department of Education.

“Project IMPACTS,” directed by James Slotta, Marcia Linn, Doug Clark. A collaboration with Denver Public Schools, University of California-Berkeley, and Arizona State University to study scaling to district-wide participation in inquiry based middle school science education for diverse students, especially second language learners. Submitted for funding consideration to IERI (NSF, OERI, NICHD).

National Advisory and Review Panel for the “Online Mathematics Initiative,” The University of Texas at Austin. (July, 2002 to 2005)

National Design Experiments Consortium, Jan Hawkins, Chair. 1993-1996.

### *Standing Review Boards & Ad Hoc Reviewer*

American Educational Research Association (AERA) Annual Meeting. Standing review board member, Division C – Section 3 (Mathematics Education) 2010, 2011, 2012.

American Educational Research Association (AERA) Annual Meeting. Standing review board member, Division C – Section 6 (Cognitive, Social and Motivational Processes) 2010, 2011, 2012.

U S Department of Education-IES Basic Processes Review Panel. Principal Reviewer. 2010 to date.

*American Educational Research Journal*. American Educational Research Association (AERA)

*Cognition and Instruction*. Lawrence Erlbaum Associates

*Cognitive Science*, Ablex Publishing

Cognitive Science Society Annual Meeting

Elsevier • North-Holland, Dept of Mathematics, Computer Science & Cognitive Science

*Educational Assessment*

*Educational Psychology Review*

*Educational Researcher*, American Educational Research Association (AERA)

Institute for Education Sciences (IES), U.S. Department of Education

Interagency Educational Research Initiative (National Science Foundation, U.S. Dept. of Education-IES, and National Institutes of Health-NICHHD)

*Journal for Research in Mathematics Education*. National Council for Teachers of Mathematics (NCTM).

*Learning and Individual Differences*, Elsevier

James S. McDonnell Foundation, Cognitive Studies for Educational Practice grants

*Mathematical Thinking and Learning* (Taylor & Francis)

*Memory & Cognition*, Psychonomic Society

National Science Foundation (NSF): ROLE, CAREER, IERI

*Review of Educational Research*, American Educational Research Association (AERA)

## **Other University and Community Service**

### *Faculty Governance*

Social Studies Divisional Committee Member (elected), University of Wisconsin, 2014; 2015-2018

Member, Committee on Honorary Degrees (appointed), University of Wisconsin, 2015-2016

Executive Committee Member, Teaching Academy, University of Wisconsin, June, 2014-2015.

Chair, Learning Sciences Graduate Program, Educational Psychology Dept., School of Education (Oct., 2005 to 2010).

Advisory Board Member, Doctoral Research Program, School of Education (2005-07). Program focuses on the professional development (vision, method, theory, experience) of aspiring educational researchers in the Education graduate program.

Representative to the Faculty Senate for the Educational Psychology Dept. (2005-2009).

Presentation to the Teaching Improvement Program in the College of Engineering (UW Teaching Academy), "How students learn: Thinking, teaching and design." With Dr. Erica Halverson (Aug. 25, 2005).

Coordinating Council for Teacher Education (CCTE) for the School of Education. Representative for Educational Psych. Dept. (2004-07)

Harassment Contact for the Educational Psychology Dept. (2004-date)

### *STEM (Science, Technology, Engineering, and Mathematics) Education*

University of Wisconsin-Madison Provost's Office for STEM Outreach Task Force (June 2012 to date). Tasked with examining the feasibility of a campus-wide Office for STEM Outreach (Kevin Niemi, Chair).

Steering Committee Member, University of WI, Delta Learning Community (2005 to date). Delta is a research, teaching and learning community for faculty, academic staff, post-docs, and graduate students that helps current and future faculty implement teaching-as-research and teaching for diverse audiences in science, engineering, and mathematics higher education. Delta operates within the CIRLT Network.

*Equity and Conflict Resolution*

Uni-Hill Peacemaker Project (Boulder, CO). Training Boulder residents and CU students in non-violence and conflict resolution skills.

Member of the Chancellor's Task Force on Civil Conduct on Boulder Campus

Victim Offender Reconciliation Project (VORP), Nashville, TN

*Technology*

Member of the American Educational Research Association (AERA) Technology Committee (formerly the Telecommunications Committee). Term 2003-06.

Member of the U. of Colorado-Boulder Faculty Assembly Committee on Technology.

Boulder (CO) Valley School District: Develop and test "KidSearch", an Internet resource for elementary school teachers and students (including non-readers)

Member of University of Colorado ATLAS Initiative for campus technology, sub-committee on Research in Educational Technology

Developed the University of Colorado-Boulder School of Education state-of-the-art classroom for teaching about and with technology (from in-house grants)

Co-Director of the WorkingShops Project for teacher professional development on technology in teaching, New Vista High School, Boulder (CO) Valley School District.

Member of the New College of Information Technology Exploratory Committee, University of Colorado.

University of Colorado, Presidents' Total Learning Environment Initiative

*University of Colorado*

Executive Board member (Elected position), Institute of Cognitive Science, University of Colorado, 1998-99 and 2001-03.

Search Committee member for Director of Institute of Cognitive Science, University of Colorado (2002-03).

Interim Program Chair, Educational Psychology, Fall, 1998.

Institute of Cognitive Science Curriculum Committee member, University of Colorado

Co-Chair, Search Committee for Science Education (Secondary Program), 2000-02

Co-Chair, Search Committee for Teaching and Learning to Teach/Ed Psych, 2001-02

Served on various Doctoral and Master's level thesis committees in Education (Educational Psychology and Instruction & Curriculum), Psychology, and Computer Science Depts.

### *Public School Outreach*

Madison Metropolitan School District External Research Committee (2005-2011).

Madison Metropolitan School District (MMSD) Mathematics Task Force member (2007-2008).

Algebra Task Force member, Boulder (CO) Valley School District

Co-Director of the Working Shops Project for teacher professional development on technology in teaching, New Vista High School, Boulder (CO) Valley School District (1996-2003).

### **In-Service Presentations for Teacher Professional Development**

**Nathan, M. J.** and Boncoddio, R. (2016-2017). Effective use of instructional gestures for promoting STEM integration. The Nevada Mathematics Project. Developed material and the overall training program for 4 week-long professional development workshops for statewide elementary grade teaching in math and integrated STEM.

**Nathan, M. J.** (2017, May) The role of the body in mathematics learning and teaching. East High School Mathematics Dept., Madison, WI. Met with teachers for a lunchtime PD session after speaking with their students on math learning.

**Nathan, M. J.** (2013, Jan). Teaching Integrated STEM Education: A 2-Day Workshop for Educators and Curriculum Developers. Institute for the Promotion of Teaching Science and Technology (IPST), Ministry of Education, Bangkok, Thailand.

**Nathan, M. J.** (2000, Aug). Students early algebra strategies: Lessons for teaching mathematics. In-service for middle and high school mathematics teachers, Boulder Valley School District.

**Nathan, M. J.** (1996, Oct). Students' many intelligences," Bollman Center, Thornton, CO (Leslie Trexler, Talented and gifted program).

**Nathan, M. J.** (1994, Apr). Video-based tools for mathematical problem solving", and "Multimedia environments to support early reading and language acquisition." The Sandra Alpert Nathan Memorial Conference, Westport, CT. Kate McGraw, Assistant Superintendent for Special Education, Chair. This was an annual in-service workshop founded in memory of my mother who was a tireless special educator.