

Richard Lehrer

Department of Teaching and Learning
166 Wyatt Center
Box 330, George Peabody College
Vanderbilt University
Nashville, TN 37203

(615) 322 1745 (office)
(615) 298 1618 (home)
rich.lehrer@vanderbilt.edu
richlehrer@comcast.net

EDUCATION

- | | |
|------|---|
| 1983 | Ph.D. University of New York at Albany, Educational Psychology and Statistics |
| 1982 | University Certificate in School Psychology, University of New York at Albany |
| 1976 | M.S. University of New York at Albany, Educational Psychology and Statistics |
| 1973 | B.S. Rensselaer Polytechnic Institute, Biology/Chemistry |

RESEARCH INTERESTS

My research focuses on the design of classroom learning environments that support practices of modeling and coordinated development of model-based reasoning in science and in mathematics. Leona Schauble and I collaborate with classroom teachers in Nashville, Phoenix, and Madison to develop a cumulative science education—a learning progression—centered around mathematical modeling of natural systems. Central to these efforts is study of the role of inscriptions and notations, including those made possible by electronic media, as mediating the development of scientific and mathematical reasoning. Our current focus is on data modeling and statistical reasoning in the middle school. Students first investigate chance and statistics in contexts of repeated measure, paralleling historic origins of statistical reasoning. Students then extend models of data and chance to describe the functioning of natural systems. Descriptions and insights gained from classroom studies inform the development of a system of assessment that blends formative and summative approaches. The latter are designed in collaboration with Mark Wilson at UC-Berkeley.

My interest in modeling is complemented by a collaboration with elementary grade teachers to re-center mathematics education around space and geometry. Together we craft a children's geometry based in bodily experiences of walking, drawing, and building that are subsequently re-described mathematically as coordinate systems, measurement systems, symmetries, and 3- and 2-D structures. These forms of mathematics are indispensable for modeling natural and social systems. The work to develop a children's geometry has been conducted in diverse settings, including urban schools (Phoenix and Nashville) and with Yup'ik children and their teachers in Alaska (with Jerry Lipka). I am also collaborating with City College Engineering to investigate children's opportunities for learning about mathematics and science when they engineer solutions to problems in the design of artifacts, such as paper pop-ups and kinetic toys.

PROFESSIONAL EXPERIENCE

2002

Professor, Department of Teaching and Learning, Peabody College, Vanderbilt University.

2001

Bascom Professor, School of Education, University of Wisconsin-Madison.

1992-1999

Professor, Department of Educational Psychology (Cognitive Science in Education) & Department of Curriculum and Instruction (Mathematics Education), University of Wisconsin-Madison.

Associate Director, National Center for Improving Student Learning and Achievement in Mathematics and Science (1996-2001)

Associate Director, National Center for Research in Mathematical Sciences Education (1992-96).

1989-1991

Associate Professor, Department of Educational Psychology, University of Wisconsin-Madison.

Visiting Professor, Carnegie Mellon University. (Fall, 1991)

1984-1989

Assistant Professor, Department of Educational Psychology, University of Wisconsin-Madison.

1977-1984

Consultant, Statistical Analysis. School of Education, University of New York at Albany. Faculty advisement in research design and method.

Lecturer, Department of Educational Psychology and Statistics, State University of New York at Albany.

School Psychologist, Schalmont Central Schools, Schenectady, N.Y.

Senior Researcher, Board of Cooperative Educational Services of Nassau County, N.Y.

1973-1976

Teacher, Bishop Gibbons High School, Schenectady, N.Y. (Chemistry, Biology, and Unified Science)

Professional Certificates

Psychologist (New York State)
 School Psychologist (New York State)
 Secondary School Teacher: Mathematics, Sciences (New York State)

Teaching

Vanderbilt University

MTED 2100 Young Children's Mathematical Thinking and Learning
 MTED 2250 Teaching Mathematics in the Elementary School
 EDUC 3120 Learning and Instruction

University of Wisconsin-Madison

Cognition & Classroom Learning [Two semester introduction to cognition and instruction]
 Designing Learning Environments [Teachers design and test classroom learning environments]
 Lego Logo [Summer institute for teachers and children focusing on cognitive apprenticeship]
 Model-Based Reasoning in Mathematics and Science

Membership in Professional Organizations

American Association for the Advancement of Science
 American Educational Research Association
 Cognitive Science Society
 National Council of Teachers of Mathematics

Current/Recent Service

* Co-Editor, *Cognition and Instruction* (02-07)

* Advisory Editor (Editorial Board):

Educational Psychologist
International Journal of Computers for Mathematical Learning

* Ad-Hoc Reviewer: *Journal of the Learning Sciences*, *Review of Educational Research*, *American Educational Research Journal*.

* Member, National Academy of Sciences/National Academy of Engineering Study Group, *Understanding and Improving K-12 Engineering Education in the United States*.

* Member, *Advisory Board*, National Science Resources Center, Smithsonian Institute

* Member, Standing review panel for mathematics and science, Institute for Educational Sciences

Past Service

Advisory Editor (Editorial Board):

American Educational Research Journal
Educational Researcher
Journal for Research in Mathematics Education
Journal of Educational Psychology

Member, Committee on Test Design for K-12 Science Achievement, National Research Council. (*Systems for State Science Assessment*).

Member, National Academy of Sciences Study Group on Cognitive Science and Assessment (*Knowing What Students Know*)

Member, American Statistical Association/National Science Foundation, *Using statistics effectively in mathematics education research*. American Statistical Association, Washington, D. C.

RESEARCH AND DEVELOPMENT ACTIVITIES

Note: All grants involving L. Schauble are fully collaborative, although agencies demand that one of us be called principal investigator.

Title: *Physical Science Comes Alive: Exploring Things that Go*
 PI: Gary Benenson
 Co-PI: Richard Lehrer
 Agency: National Science Foundation
 Date: October 2007-September 2012
 Amount: \$2,406,567

*Title: *Assessing Data Modeling and Statistical Reasoning*
 Co-PI: Richard Lehrer, Leona Schauble, Mark Wilson
 Agency: Institute for Educational Studies
 Date: July 2006 - July 2010
 Amount: \$1,600,0000

*Title: *Supporting the Development of Model-based Reasoning*
 Co-PI: Leona Schauble, Richard Lehrer
 Agency: National Science Foundation
 Date: July 2006 - June 2008

Amount: \$1,700,000

*Title: *Model Chance*
 PI: Cliff Konold
 Co-PI: Richard Lehrer
 Agency: National Science Foundation
 Date: June 2005 - June 2008
 Amount: \$378,898.00

*Title: *Constructing Data, Modeling Worlds: Collaborative Investigation of Statistical Reasoning.*
 Co-PI: Rogers Hall, Cliff Konold, Leona Schauble, Mark Wilson
 Agency: National Science Foundation
 Date: January, 2004 to January, 2007
 Amount: \$1,600,000

Title: *A Multi-constituency Initiative for Coordinating and Directing Curriculum Development, Assessment, and Research for the Teaching and Learning of Probability and Statistics, K-12.*
 Co-PI: Tim Kelly
 Agency: Spencer Foundation
 Date: June 2000 to January 2001
 Amount: \$50,000

Title: *Technology-Enhanced Learning of Geometry in Elementary Schools*
 PI: Daniel Lynn Watt
 Co-PI: Douglas Clements, Richard Lehrer
 Agency: National Science Foundation
 Date: October, 1999 to June, 2003
 Amount: \$850,000

Title: *Modeling Nature: A Route to Understanding Central Themes in Elementary and Middle School Science*
 Co-PI: Richard Lehrer, Leona Schauble
 Agency: National Science Foundation
 Date: June, 1999 to September 2002
 Amount: \$1,100,000

Title: *National Center for Improving Student Learning and Achievement in Mathematics and Science*
 Director: Thomas A. Romberg
 Agency: Office of Educational Research and Improvement, U. S. Department of Education
 Date: March, 1996 to June, 2001
 Amount: \$12,500,000

Title: *Teaching and Learning Geometry for Understanding*
 Agency: National Science Foundation
 Date: September, 1995 to September 1996

Amount: \$96,825

Title: *Building Bridges Between Mathematics and Science*
 Co-P.I.: Richard Lehrer, Leona Schauble
 Agency: James S. McDonnell Foundation
 Date: June, 1995 to August, 1998
 Amount: \$540,000

Title: *Thinking About Simple Machines: Model-Based Reasoning in Design Contexts*
 Co-P.I.: Richard Lehrer, Leona Schauble
 Agency: National Science Foundation
 Date: September, 1994 to August, 1997
 Amount: \$502,000

Title: *Hypermedia-based Instruction for Teachers' Professional Development*
 Agency: National Science Foundation, Subcontract with co P.I.s, Elizabeth Fennema and Thomas Carpenter.
 Date: January, 1993 to August, 1994

Title: *Learning and Teaching Geometry*
 Agency: National Center for Research in Mathematical Sciences Education (Thomas Romberg, Director), Office for Educational Research and Improvement
 Date: January, 1992 - June, 1995
 Amount: \$420,000

Title: *Hypermedia-based Instruction for Magnetic Resonance Imaging*
 Agency: General Electric Corporation - Medical Division
 Date: June, 1991 - May, 1992
 Amount: \$92,500

Title: *Using Hypermedia to Train School Psychologists as Consultants*
 Co-PI: Thomas Kratochwill, Stephen Elliott
 Agency: Wisconsin Department of Public Instruction, Iowa Department of Public Instruction
 Date: Sept. 1991 - June, 1992
 Amount: \$14,289.47

Title: *Hypermedia and Knowledge Design: A New Paradigm for Instruction*
 Agency: University of Wisconsin Outreach Initiative
 Date: June, 1990 to August, 1991
 Amount: \$15,000.00

Title: *History by Design*
 Agency: Robert M. La Follette Institute of Public Affairs
 Date: July, 1990 to September, 1991
 Amount: \$12,969.00

Title: *Children's and Adolescent's Conceptions of Human and Computer Intelligence*
 Agency: University of Wisconsin-Madison, Graduate School Research Committee
 Date: January, 1989 to December, 1989
 Amount: \$7,983.00

Title: *Meno: A Tool for Knowledge Development in Geometry*
 Agency: Ameritech Foundation
 Date: January, 1989 to December, 1989
 Amount: \$10,852.00

Title: *Children's Perceptions of Educational Software*
 Agency: International Business Machines
 Date: September, 1987 to June, 1988
 Amount: \$16,000.00

Title: *Graphical Displays of Cognitive Processes*
 Agency: International Business Machines, Project TROCHOS, Instructional Computing
 Date: September, 1987 to July, 1988
 Amount: \$21,000.00

Title: *Cognitive Consequences of Logo-based Instruction*
 Agency: Spencer Foundation
 Date: September, 1986 to August, 1987
 Amount: \$7,500

Title: *Inquiry-based Instruction with Logo*
 Agency: University of Wisconsin-Madison Graduate Research Committee
 Date: July, 1985 to June, 1986
 Amount: \$13,000.00

AWARDS

2006 Visiting Scholar, Australian Centre for Educational Studies, Macquarie University
 2001 Sears-Bascom Chair, University of Wisconsin-Madison
 1999 Vilas-Associate Professor, University of Wisconsin-Madison
 1983 President's Distinguished Dissertation Award, University of New York at Albany

PUBLICATIONS

Articles in Refereed Journals

Note: **All authorship with L. Schauble is fully collaborative.**

- *Lehrer, R., Kim, M., & Schauble, L. (in press). Supporting the development of conceptions of statistics by engaging students in modeling and measuring variability. *International Journal of Computers in Mathematics Education*.
- Seymour, J., & Lehrer, R. (2006). Tracing the evolution of pedagogical content knowledge as the development of interanimated discourses. *Journal of the Learning Sciences, 15* (4), 551-584.
- Lucas, D., Broderick, N., Lehrer, R., & Bohanan, R. (2005). Making the grounds of scientific inquiry visible in the classroom. *Science Scope, 29* (3), 39-42.
- Lehrer, R., & Schauble, L. (2004). Modeling natural variation through distribution. *American Educational Research Journal, 41*(3), 635-679.
- Lesh, R., & Lehrer, R. (2003). Models and modeling perspectives on the development of students and teachers. *Mathematical Thinking and Learning, 5* (2 & 3), 109-129.
- Petrosino, A., Lehrer, R., & Schauble, L. (2003). Structuring error and experimental variation as distribution in the fourth grade. *Mathematical Thinking and Learning, 5* (2&3), 131-156.
- Cobb, P., Confrey, J., diSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in education research. *Educational Researcher, 32* (1), 9-13.
- Lehrer, R., Strom, D., & Confrey, J. (2002). Grounding metaphors and inscriptional resonance: Children's emerging understanding of mathematical similarity. *Cognition and Instruction, 20*, 359-398.
- Strom, D., Kemeny, V., Lehrer, R., & Forman, E. (2001). Visualizing the emergent structure of children's mathematical argument. *Cognitive Science, 25*, 733-773.
- Horvath, J., & Lehrer, R. (2000). The design of a case-based hypermedia teaching tool. *International Journal of Computers for Mathematical Learning, 5*, 115-141.
- Jacobson, C., & Lehrer, R. (2000). Teacher appropriation and student learning of geometry through design. *Journal for Research in Mathematics Education, 31*, 71-88.
- Lehrer, R., & Curtis, C. L. (2000) Why are some solids perfect? Conjectures and experiments by third graders. *Teaching Children Mathematics, 6*, 324-329.
- Lehrer, R., & Schauble, L. (2000). Inventing data structures for representational purposes: Elementary grade students' classification models. *Mathematical Thinking and Learning, 2*, 49-72.

- Lehrer, R., & Schauble, L. (2000). The development of model-based reasoning. *Journal of Applied Developmental Psychology, 21*(1), 39-48.
- Penner, E., & Lehrer, R. (2000). The shape of fairness. *Teaching Children Mathematics, 7*(4), 210-214.
- Lehrer, R., Lee, M., & Jeong, A. (1999). Reflective teaching of Logo. *Journal of the Learning Sciences, 8*, 245-288.
- Erickson, J., & Lehrer, R. (1998). The evolution of critical standards as students design hypermedia documents. *Journal of the Learning Sciences, 7*, 351-386. [Equal contribution of authors.]
- Koehler, M., & Lehrer, R. (1998). Designing a hypermedia tool for learning about children's mathematical cognition. *Journal of Educational Computing Research, 18*(2), 123-145.
- Lehrer, R., & Schauble, L. (1998). Reasoning about structure and function: Children's conceptions of gears. *Journal of Research in Science Teaching, 35*(1), 3-25.
- Penner, D. E., Lehrer, R., & Schauble, L. (1998). From physical models to biomechanics: A design-based modeling approach. *Journal of the Learning Sciences, 7*, 429-449.
- Lehrer, R., & Shumow, L. (1997). Aligning the construction zones of parents and teachers for mathematics reform. *Cognition and Instruction, 15*(1), 41-83.
- Penner, D. E., Giles, N. D., Lehrer, R., & Schauble, L. (1997). Building functional models: Designing an elbow. *Journal of Research in Science Teaching, 34*(2), 1-20.
- Lehrer, R., & Romberg, T. (1996). Exploring children's data modeling. *Cognition and Instruction, 14*, 69-108.
- Nitabach, E., & Lehrer, R. (1996). Developing spatial sense through area measurement. *Teaching Children Mathematics, 8*, 473-476.
- Lehrer, R., Horvath, J., & Schauble, L. (1994). Developing model-based reasoning. *Interactive Learning Environments, 4*, 218-232.
- Lehrer, R., Erickson, J., & Connell, T. (1994). Learning by designing hypermedia documents. *Computers in the schools, 10*(2/3), 227-254.
- Lehrer, R., & Littlefield, J. (1993). Relationships among cognitive components in Logo learning and transfer. *Journal of Educational Psychology, 85*, 317-330. [Equal contribution of authors.]
- Amundson, R., Serlin, R. C., & Lehrer, R. (1992). On the threats that do *not* face educational research. *Educational Researcher, 21*(9), 19-24.
- Carver, S. M., Lehrer, R., Connell, T., & Erickson, J. (1992). Learning by hypermedia design: Issues of assessment and implementation. *Educational Psychologist, 27*, 385-404.

- Lehrer, R. (1992). New directions in technology-mediated learning. *Educational Psychologist*, 27, 287-290.
- Lehrer, R., & Franke, M. L. (1992). Applying personal construct psychology to the study of teachers' knowledge of fractions. *Journal for Research in Mathematics Education*, 23, 223-241.
- Middleton, J. A., Littlefield, J., & Lehrer, R. (1992). Gifted students' conceptions of academic fun: An examination of a critical construct for gifted education. *The Gifted Child Quarterly*, 36(1), 38-44.
- Lehrer, R., & Littlefield, J. (1991). Misconceptions in Logo: The role of instruction. *Journal of Educational Psychology*, 83, 124-133. [Equal contribution of authors.]
- Lehrer, R., Serlin, R. C., & Amundson, R. (1990). Knowledge or certainty? A reply to Cziko. *Educational Researcher*, 19(6), 16-19.
- Salmon, D., & Lehrer, R. (1991). Experience and representation of the consultant role: Exploring the implicit theories of school psychology trainers and students. *School Psychology Quarterly*, 6, 112-130.
- Lehrer, R., Randle, L., & Sancilio, L. (1989). Learning pre-proof geometry with Logo. *Cognition and Instruction*, 6, 159-184.
- Salmon, D., & Lehrer, R. (1989). School consultants' implicit theories of action. *Professional School Psychology*, 4, 173-187.
- Lee, O., & Lehrer, R. (1988). Conjectures concerning the origins of misconceptions in Logo. *Journal of Educational Computing Research*, 4, 87-105.
- Lehrer, R., Guckenberger, T., & Lee, O. (1988). A comparative study of the cognitive consequences of inquiry-based Logo instruction. *Journal of Educational Psychology*, 80, 543-553.
- Simon, J., & Lehrer, R. (1988). The relationship of audiometric measures to performance on a preschool developmental screening instrument. *Journal of Applied Developmental Psychology*, 9, 107-123.
- Lehrer, R., & DeBernard, A. (1987). The language of learning and the language of computing. *Journal of Educational Psychology*, 79, 41-48.
- Lehrer, R., & Randle, L. (1987). Problem solving, metacognition and composition: The effects of interactive software for first-grade children. *Journal of Educational Computing Research*, 3, 401-425.
- Lehrer, R., Levin, B. B., DeHart, P., & Comeaux, M. (1987). Voice-feedback as a scaffold for writing: A comparative study. *Journal of Educational Computing Research*, 3, 335-353.

- Lehrer, R., Harckham, L. D., Archer, P., & Pruzek, R. M. (1986). Microcomputer-based instruction in special education. *Journal of Educational Computing Research*, 2, 337-355.
- Lehrer, R. (1986). Logo as a strategy for developing thinking? *Educational Psychologist*, 21, 121-137.
- Mancuso, J. C., Litchford, G., Wilson, S., Harrigan, J., & Lehrer, R. (1983). Inferences of mental illness from noninvolvement. *Journal of Personality*, 51, 49-61.
- Walmsley, S., Scott, K., & Lehrer, R. (1981). Effects of document simplification on the reading comprehension of the elderly. *Journal of Reading Behavior*, 13, 237-247.

Book Chapters

Note: All authorship with L. Schauble is collaborative.

- *Konold, C., & Lehrer, R. (2008). Technology and mathematics education: An essay in honor of Jim Kaput. In L. D. English (Ed.), *Handbook of International Research in Mathematics Education* (2nd ed). Philadelphia: Taylor & Francis. [equal contribution of authors]
- *Boester, T., & Lehrer, R. (2007). Visualizing algebraic reasoning. In J. Kaput, D. W. Carraher, & M. Blanton (Eds.), *Algebra in the early grades*. (pp. 211-234). Mahwah, NJ: Lawrence Erlbaum Associates.[equal contribution of authors]
- Lehrer, R., & Schauble, L. (2007). A developmental approach for supporting the epistemology of modeling. In W. Blum, P. L. Galbraith, H-W. Henn, & M. Niss (Eds.), *Modeling and applications in mathematics education*. (pp. 153-160). New York: Springer.
- *Lehrer, R., & Schauble, L. (2007). Contrasting emerging conceptions of distribution in contexts of error and natural variation. In M. Lovett & P. Shah (Eds.), *Thinking with Data*. (pp 149-176). New York: Taylor & Francis.
- Lehrer, R., & Schauble, L. (2006). Cultivating model-based reasoning in science education. In R. Keith Sawyer (Ed.), *Cambridge Handbook of the Learning Sciences* (pp. 371-387). Cambridge: Cambridge University Press.
- Lehrer, R., & Schauble, L. (2006). Scientific thinking and science literacy. In W. Damon, R. Lerner, K. Anne Renninger, & I. E. Sigel, (Eds.), *Handbook of Child Psychology, Sixth Edition, Volume Four: Child Psychology in Practice*. (pp 153-196). Hoboken, NJ: John Wiley & Sons.
- Lehrer, R., & Schauble, L. (2005). Developing modeling and argument in elementary grades. In T. A. Romberg, T.P. Carpenter, & F. Dremock (Eds.) *Understanding mathematics and science matters*. (pp 29-53). Mahwah, NJ: Lawrence Erlbaum Associates.
- Lehrer, R. (2003). Developing understanding of measurement. In J. Kilpatrick, W. G. Martin, & D. E. Schifter (Eds.), *A research companion to principles and standards for school mathematics*. (pp.179-192). Reston, VA: National Council of Teachers of Mathematics.

- Lehrer, R., & Lesh, R. (2003). Mathematical learning. In W. Reynolds & G. Miller (Eds.), *Comprehensive handbook of psychology*, Volume 7. (pp. 357 –391). New York: John Wiley.
- Lehrer, R., & Schauble, L. (2003). Origins and evolution of model-based reasoning in mathematics and science. In R. Lesh & H. M. Doerr (Eds.), *Beyond constructivism: A models and modeling perspective on mathematics problem-solving, learning, and teaching*. (pp. 59-70). Mahwah, NJ: Lawrence Erlbaum Associates.
- Lehrer, R., Jaslow, L., & Curtis, C. (2003). Developing understanding of measurement in the elementary grades. In D. H. Clements & G. Bright (Eds.), *Learning and Teaching Measurement. 2003 Yearbook*. (pp. 100-121). Reston, VA: National Council of Teachers of Mathematics.
- Lehrer, R., & Pritchard, C. (2002). Symbolizing space into being. In K. Gravemeijer, R. Lehrer, B. van Oers, & L. Verschaffel (Eds.), *Symbolization, modeling and tool use in mathematics education*. (pp. 59-86). Dordrecht, Netherlands: Kluwer Academic Press.
- Jacobson, C., & Lehrer, R. (2002). Teacher appropriation and student learning of geometry through design. In J. Sowder & B. Schappelle (Eds.), *Lessons learned from research*. Reston, VA: National Council of Teachers of Mathematics.
- Lehrer, R., & Schauble, L. (2002). Symbolic communication in mathematics and science: Co-constituting inscription and thought. In E. D. Amsel & J. Byrnes (Eds.), *Language, literacy, and cognitive development. The development and consequences of symbolic communication*. (pp. 167-192). Mahwah, NJ: Lawrence Erlbaum Associates.
- Lehrer, R., Giles, N., & Schauble, L. (2002). Data modeling. In R. Lehrer & L. Schauble (Eds.), *Investigating real data in the classroom: Expanding children's understanding of math and science*. (pp. 1-26). New York: Teachers College Press.
- Lehrer, R., Schauble, L., & Petrosino, A. (2001). Reconsidering the role of experiment in science education. In K. Crowley, C. Schunn, & T. Okada (Eds.), *Designing for science: Implications from everyday, classroom, and professional settings*. (pp. 251-278). Mahwah, N.J.: Lawrence Erlbaum Associates.
- Lehrer, R., Schauble, L., Strom, D., & Pligge, M. (2001). Similarity of form and substance: Modeling material kind. In D. Klahr & S. Carver (Eds.), *Cognition and instruction: 25 years of progress*. (pp. 39-74). Mahwah, NJ: Lawrence Erlbaum Associates.
- Erickson, J., & Lehrer, R. (2000). What's in a link? Student conceptions of the rhetoric of association in hypermedia composition. In S. Lajoie (Ed.), *Computers as cognitive tools* (Vol. 2). (pp. 197-226). Mahwah, NJ: Lawrence Erlbaum Associates. [Equal contribution of authors.]
- Lesh, R., & Lehrer, R. (2000). Iterative refinement cycles for videotape analyses of conceptual change. In A. Kelly & R. Lesh (Eds.), *Research design in mathematics and science education* . (pp. 665-708). Dordrecht, Netherlands: Kluwer Academic Press.

- Lehrer, R., & Schauble, L. (2000). Modeling in mathematics and science. In R. Glaser (Ed.), *Advances in instructional psychology* (Vol. 5). (pp. 101-159). Mahwah, NJ: Lawrence Erlbaum Associates.
- Lehrer, R., Carpenter, S., Schauble, L., & Putz, A. (2000). Designing classrooms that support inquiry. In J. Minstrell & E. V. Zee (Eds.), *Inquiring into inquiry learning and teaching in science* (pp. 80-99). Washington, D.C.: American Association for the Advancement of Science.
- Lehrer, R., Schauble, L., Carpenter, S., & Penner, D. E. (2000). The inter-related development of inscriptions and conceptual understanding. In P. Cobb, E. Yackel, & K. McClain (Eds.), *Symbolizing and communicating in mathematics classrooms: Perspectives on discourse, tools, and instructional design* (pp. 325-360). Mahwah, NJ: Lawrence Erlbaum Associates.
- Carpenter, T. P., & Lehrer, R. (1999). Teaching and learning mathematics with understanding. In E. Fennema & T. R. Romberg (Eds.), *Mathematics classrooms that promote understanding* (pp. 19-32). Mahwah, NJ: Lawrence Erlbaum Associates.
- Lehrer, R., & Romberg, T. A. (1999). Springboards to geometry. In V. Villani & C. Mammana (Eds.), *Perspectives on the teaching of geometry for the 21st century* (pp. 62-71). Dordrecht, Netherlands: Kluwer Academic Publishers.
- Lehrer, R., Jacobson, C., Kemeny, V., & Strom, D. (1999). Building on children's intuitions to develop mathematical understanding of space. In E. Fennema & T. A. Romberg (Eds.), *Mathematics classrooms that promote understanding* (pp. 63-87). Mahwah, NJ: Lawrence Erlbaum Associates.
- Horvath, J. K., & Lehrer, R. (1998). A model-based perspective on the development of children's understanding of chance and uncertainty. In S. P. LaJoie (Ed.), *Reflections on statistics: agendas for learning, teaching and assessment in K-12* (pp. 121-148). Mahwah, NJ: Lawrence Erlbaum Associates.
- Lehrer, R., Jenkins, M., & Osana, H. (1998). Longitudinal study of children's reasoning about space and geometry. In R. Lehrer & D. Chazan (Eds.), *Designing learning environments for developing understanding of geometry and space* (pp. 137-167). Mahwah, NJ: Lawrence Erlbaum Associates.
- Lehrer, R., Jacobson, C., Thoyre, G., Kemeny, V., Strom, D., Horvath, J., Gance, S., & Koehler, M. (1998). Developing understanding of geometry and space in the primary grades. In R. Lehrer & D. Chazan (Eds.), *Designing learning environments for developing understanding of geometry and space* (pp. 169-200). Mahwah, NJ: Lawrence Erlbaum Associates.
- Towell, G., & Lehrer, R. (1995). A knowledge-based model of geometry learning. In T. Petsche, S. J. Hanson, & J. Shavlik (Eds.), *Computational learning theory and natural learning systems* (pp. 54-74). Cambridge, MA: MIT Press. (Revision of earlier piece.)

- Lehrer, R., Erickson, J., & Connell, T. (1994). Learning by designing hypermedia documents. In W. M. Reed, J. K. Burton, & M. Liu (Eds.), *Multimedia and megachange: New roles for educational computing* (pp. 227-254). New York, NY: Haworth Press.
- Towell, G., & Lehrer, R. (1993). A knowledge-based model of geometry learning. In S. J. Hanson, J. D. Cowan, & C. L. Giles (Eds.), *Advances in neural information processing systems* (pp. 887-894). San Mateo, CA: Morgan Kaufmann.
- Lehrer, R. (1993). Authors of knowledge: Patterns of hypermedia design. In S. Lajoie & S. J. Derry (Eds.), *Computers as cognitive tools* (pp. 197-227). Hillsdale, NJ: Erlbaum.
- Lehrer, R. (1989). Computer-assisted strategic instruction. In C. B. McCormick, G. E. Miller, & M. Pressley (Eds.), *Cognitive strategy research: From basic research to educational applications* (pp. 303-320). New York, NY: Springer-Verlag.
- Lehrer, R., Guckenberg, T., & Sancilio, L. (1988). Influences of Logo on children's intellectual development. In R. E. Meyer (Ed.), *Teaching and learning computer programming: Multiple research perspectives* (pp. 75-110). Hillsdale, NJ: Erlbaum.
- Lehrer, R. (1988). Characters in search of an author: The self as a narrative structure. In J. C. Mancuso & M. Shaw (Eds.), *Cognition and personal structure: Computer access and analysis* (pp. 195-228). New York, NY: Praeger Press.
- Mancuso, J. C., & Lehrer, R. (1986). Cognitive processes in socializing reactions to rule violation. In R. D. Ashmore & D. M. Brodzinsky (Eds.), *Thinking about the family* . (pp. 67-93). Englewood Cliffs, NJ: Lawrence Erlbaum Associates.
- Eimer, B., Mancuso, J. C., & Lehrer, R. (1983). A constructivist theory of reprimand as it applies to child rearing, *Proceedings of the Eleventh Annual interdisciplinary UAP-USC Piagetian Theory and the Helping Professions Conference* . Los Angeles, CA: University of Southern California Press.
- Anastasiow, M., & Lehrer, R. (1982). Adolescent development: Systems and their interactions. In N. Anastasiow (Ed.), *The adolescent parent* (pp. 13-32). Baltimore, MD: Paul Brooks.

Books

- Gravemeijer, K., Lehrer, R., van Oers, B., & Verschaffel, L. (2002, Eds.), *Symbolization, modeling and tool use in mathematics education*. Dordrecht, Netherlands: Kluwer Academic Press.
- Lehrer, R., & Schauble, L. (2002, Eds.). *Investigating real data in the classroom: Expanding children's understanding of math and science*. New York: Teachers College Press.
- National Research Council (2001). *Knowing what students know. The science and design of educational assessment*. Washington, D.C.: National Academy Press. [Jim Pellegrino, Robert Glaser, Co-Chairs.]

- Lehrer, R., & Chazan, D. (1998, Eds.). *Designing learning environments for developing understanding of geometry and space*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Lehrer, R., Littlefield, J., Wottreng, B., & Youngerman, N. (1993). *Seeding mindstorms: Using LogoWriter in the elementary classroom*. (Revised edition) Fontana, WI: B & B Publishing.
- Lehrer, R., Littlefield, J., & Wottreng, B. (1991). *Seeding mindstorms: Using LogoWriter in the elementary classroom*. Fontana, WI: B & B Publishing.

Reviews

- Lehrer, R. (2000). Developing mathematical skills: What develops, and why? *American Journal of Psychology, Winter*, 649-652. [Review of C. Donlan (Ed.), The development of mathematical skills.]
- Lehrer, R. (1998). Models as explanations. [Review of A. H. Schoenfield, Toward a theory of teaching-in-context]. *Issues in Education*.
- Lehrer, R. (1998). Let's rethink the primary school mathematics curriculum. [Commentary on the book by S. Griffin and R. Case, Re-thinking the primary school math curriculum: An approach based on cognitive science]. *Issues in Education*.
- Lehrer, R. (1997). [Review of Cognition on Cognition]. *International Journal of Neural Systems*.
- Lehrer, R. (1995). [Review of N. Negroponte, Being digital]. *Journal of Educational Computing Research*, 13, 207-209.
- Lehrer, R. (1992). Design goes to school. [Review of I. Harel, Children designers]. *Journal of Educational Computing Research*, 8, 255-258.
- Lehrer, R. (1990). [Review of Suffolk Reading Scale. In J. J. Kramer & J. C. Conoley (Eds.), The Eleventh Mental Measurement Yearbook].
- Lehrer, R. (1990). [Review of Progressive Achievement Tests in Reading: Reading Comprehension and Reading Vocabulary]. In J. J. Kramer & J. C. Conoley (Eds.), The Eleventh Mental Measurement Yearbook.
- Yussen, S. R., & Lehrer, R. (1989). [Review of G. Forman & P. B. Pufall (Eds.), Constructivism in the computer age]. *Educational Technology*, 29, 55-56.
- Lehrer, R. (1985). [Review of Preschool screening: To refer or not to refer? That is the question. Or is it?]. *Contemporary Psychology*, 30, 565-566.

Technical Reports

- Lehrer, R. (2000, Winter). *Measurement*. White Paper prepared for the Standards 2000 Group of the National Council of Teachers of Mathematics, Reston, VA.
- Lehrer, R. (1999, Summer). *Development of reasoning about space and geometry, K-8*. Brief prepared for the National Academy of Sciences National Research Council, Washington, D. C.
- Lehrer, R., Petrosino, A., & Koehler, M. (1997, Summer). *Hypermedia technologies for case-based teacher education*. White Paper prepared for the Technology Standards Group of the National Council of Teachers of Mathematics, Reston, VA.
- Modeling in Mathematics and Science Collaborative. (1997, Summer). *Children's work with data..* Wisconsin Center for Education Research, Madison, WI.
- Lehrer, R., & Jacobson, C. (1994, Winter). *Geometry in the primary grades*. (NCRMSE Research Review: The teaching and learning of mathematics, 3(1), 4-14).
- Lehrer, R., Fennema, E., Carpenter, T., & Ansell, E. (1992, April). *Cognitively guided instruction in geometry*. Wisconsin Center for Education Research, Madison, WI.
- Towell, G. G., Lehrer, R., & Shavlik, J. (1990, March). *A model of learning geometric reasoning*. (Computer Sciences Technical Report #923), University of Wisconsin-Madison.

Media/Software Productions

- Case-based Hypermedia Tool for Teachers' Professional Development (designed by Matthew Koehler).
- Learning About Area Measure (video).
- Learning About Length Measure (video).
- Geometry Through Design (video).
- HyperAuthor (Hypermedia authoring tool).

PAPER PRESENTATIONS AT PROFESSIONAL MEETINGS

Note: All presentations with Leona Schauble are collaborative.

- Lehrer, R. (2007, November). *Learning to reason about variability and chance by inventing measures and models*. Inaugural address, Moore Lecture Series, Friday Institute for Educational Innovation, College of Education, NC State University, Raleigh, NC.
- Lehrer, R. (2007, October). *Developing relations among distinct disciplinary practices: Mathematics, science, and engineering*. National Research Council, Committee on Understanding and Improving K-12 Engineering Education in the United States.
- *Lehrer, R. (2007, July). *Introducing students to data representation and statistics*. Invited keynote address, Annual Meeting of the Mathematics Education Research Group of Australasia, Hobart, Tasmania.
- *Lehrer, R. (2007, July). *Developing spatial mathematics*. Invited keynote address, Annual Meeting of the Australian Association of Mathematics Teachers, Hobart, Tasmania.
- *Lehrer, R., & Schauble, L. (2007, April). *Supporting the development of model-based reasoning*. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.
- *Lehrer, R. (2007, April). *Collaboration at the boundaries: Brokering learning and assessment improves student achievement*. [Chair and Organizer] Symposium presented at the annual meeting of the American Educational Research Association, Chicago, IL.
- *Lehrer, R. (2007, January). *Modeling nature: Designing a science education around the invention and revision of models*. Invited Address, Colloquium Series of the Learning Sciences Institute, Vanderbilt University, Nashville, TN.
- *Lehrer, R. (2006, November). *Introducing students to distribution and chance via repeated measure*. Invited lecture, Department of Mathematics, Michigan State University, East Lansing, MI.
- Lehrer, R. (2006, June). *Measurement affords a conceptual terrain for developing mathematical and scientific reasoning*. Invited address, Centre for Research in Mathematics and Science Education at Macquarie University, Sydney, Australia.
- Lehrer, R. (2006, May). *Conceptual change in science is coordinated with children's developing conceptions of measure*. Invited address, Institute for Learning Sciences, Rutgers University, Newark, NJ.
- Lehrer, R. (2006, April). Discussant for: *Connecting Discourse, Teaching, and Curriculum* (Beth Herbel-Eisenmann, Chair). Research symposium presented at the annual meeting of the National Council of Teachers of Mathematics, St. Louis, MO.

- Lehrer, R. (2006, April). Participant (with K. Sawyer, C. Weinstein, Gerunda Hughes), Graduate Student Council Division C Fireside Chat. *Getting the Word Out about Your Research: Emerging Scholars and Publishing in Public Forums*. American Educational Research Association, San Francisco, CA.
- Lehrer, R. (2006, April). *Learning progressions and assessment*. In M. Wilson (Chair), *Systems for state science assessment*. (overview of NRC report). American Educational Research Association, San Francisco, CA.
- Lehrer, R., Konold, C., & Kim, M. (2006, April). *Constructing data, modeling chance in the middle school*. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA.
- Schauble, L., & Lehrer, R. (2005, December). *Taking a modeling approach to science instruction*. Invited address, Council for Elementary Science International, National Science Teachers Association, Nashville, TN.
- Lehrer, R., & Schauble, L. (2005, November). *Modeling nature*. Invited address, *Ninth Annual Science and Math Teachers Conference*, American University of Beirut, Beirut, Lebanon.
- Knapp, N. & Lehrer, R. (2005, June). *Changes in children's conceptions of spatial measure: Coordinating talk and inscription*. Paper presented in Understanding, building, and using symbolic representations of space and time. (M. Wiser, Organizer). *35th Annual Meeting of the Jean Piaget Society, Vancouver, Canada*.
- Lehrer, R. (2005, May). *Modeling nature: Introducing children to practices and concepts of science*. Invited paper, Center for Education, National Academy of Science, Washington, D. C.
- Lehrer, R. (2005, February). *Developing spatial mathematics*. Invited address, Numeracy and Mathematics Facilitators' National Conference, Auckland, NZ.
- Hall, R., Lehrer, R., Lucas, D., & Schauble, L. (2004, June). *Of grids and jars: A comparative analysis of representational infrastructure and learning opportunities in middle school and professional science*. Sixth International Conference of the Learning Sciences, Santa Monica, CA.
- Lehrer, R., & Schauble, L. (2004, June). *Contrasting emerging conceptions of distribution in contexts of error and natural variation*. The 33rd Carnegie Symposium on Cognition, "Thinking with Data," Pittsburgh, PA.
- Lehrer, R., Catley, K., & Reiser, B. (2004, May). *Tracing a trajectory for developing understanding of evolution*. Invited paper for the National Research Council Committee on Test Design for K-12 Science Achievement, Washington, D. C.
- Lehrer, R. (2004, April). *Developing modeling and argument in K-8 schooling*. Invited address, PRISM Institute, Georgia Institute of Technology, Atlanta, GA.

- Lehrer, R., & Schauble, L. (2004, April). *Modeling aquatic systems: Contexts and practices for supporting inquiry, agency and epistemology*. Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA.
- Lehrer, R. (2003, December). *Longitudinal study of the development of concepts of volume and its measure*. Invited Colloquium, Syracuse University, Department of Mathematics, Syracuse, NY.
- Lehrer, R., & Schauble, L. (2003, August). *Distribution as a resource for science education*. Paper presented at the European Association for Research on Learning and Instruction, Padova, Italy.
- Seymour, J., & Lehrer, R. (2003, August). *Pedagogical content knowledge as interanimation of discourses*. Paper presented at the annual meeting of the American Psychological Association, Toronto, CA.
- Lehrer, R., & Schauble, L. (2003, April). *Designing communities of practice*. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.
- Lehrer, R. (2003, February). *Inscriptions, talk, and conceptual change*. Invited presentation, Wintertext Conference, Jackson's Hole, Wyoming.
- Lehrer, R. (2002, October). *Shaping space*. Invited address to the Illinois Council of Teachers of Mathematics, Peoria, IL.
- Lehrer, R. (2002, October). *Thinking with and about data*. Invited address to the 2nd Biennial Cognitively Guided Instruction National Conference, St. Paul, MN.
- Lehrer, R. (2002, September). *Research on learning: Implications for curriculum evaluation*. Invited presentation, National Research Council, Washington, D.C.
- Lehrer, R. (2002, February.) *Distribution: Modeling error and natural variation in the elementary grades*. Paper presented at the US-Russia Forum on Elementary Mathematics, Honolulu, Hawaii.
- Lehrer, R. (2002, February). *Developing understanding of measurement and geometry*. Paper presented at the US-Russia Forum on Elementary Mathematics, Honolulu, Hawaii.
- Lehrer, R. (2001, June). *Mind tools*. Invited address, Federal University of Bahia, Salvador, Brazil.
- Lehrer, R. (2001, April). *Children's work with data*. In T. Kelly (Chair), *Involving teachers in research on students' statistical understanding*. Symposium conducted at the 79th annual meeting of the National Council of Teachers of Mathematics, Orlando, FL.
- Lehrer, R., & Schauble, L. (2001, April). *Accounting for contingency in design experiments*. In P. Cobb (Chair), *Design experiments, or engineering prototypes of interactive learning environments in science and mathematics*. Symposium conducted at the annual meeting of the American Educational Research Association, Seattle, WA.

- Schauble, L., & Lehrer, R. (2001, April). *Distributions as signatures of growth*. In R. Lehrer (Chair), *Developing conceptions of variability and distribution*. Symposium conducted at the annual meeting of the American Educational Research Association, Seattle, WA.
- Lehrer, R., & Schauble, L. (2000, July). *Distributions as signatures of biological processes*. Paper presented at the PCMI working group meeting on the Growth and Development of Student Reasoning about Data and Chance, Institute for Advanced Study, Princeton, NJ.
- Lehrer, R. (2000, April). *Designing for development*. In E. Forman (Chair), *Strengths and challenges of developmental approaches to research in education*. Symposium conducted at the annual meeting of the American Educational Research Association, New Orleans, LA.
- Lehrer, R., & Pritchard, C. (2000, April). *Building on experiences of large-scale space to develop coordinate geometry*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.
- Lehrer, R., & Schauble, L. (2000, April). *Designing for teacher community*. In J. Confrey (Chair), *Implementation research supporting the development of teacher professional communities and improved student learning*. Symposium conducted at the annual meeting of the American Educational Research Association, New Orleans, LA.
- Petrosino, A., Lehrer, R., & Schauble, L. (2000, April). *Distribution: A foundational resource for experiment in science education*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.
- Lehrer, R., & Schauble, L. (1999, October). *Scientific reasoning as modeling: the development of representational competence*. In D. Klahr (Chair), *The development of scientific reasoning processes*. Symposium conducted at the first annual meeting of the Cognitive Development Society, Chapel Hill, N.C.
- Koehler, M. J., Petrosino, A. J., & Lehrer, R. (1999, June). *Elements of case design for hypermedia environments in teacher education*. Paper presented at the World Conference on Educational Multimedia, Seattle, WA.
- Lehrer, R., Schauble, L., Strom, D., & Pligge, M. (1999, June). *Similarity of form and substance: From inscriptions to models*. Paper presented at the Carnegie Symposium, Pittsburgh, PA.
- Lehrer, R., & Schauble, L. (1999, April). *The long-term development of knowledge: Coherence and cumulation in students' science learning*. In R. Lehrer & L. Schauble (Co-chairs), *What have we learned from science education reform?* Symposium conducted at the annual meeting of the American Educational Research Association, Montreal, Canada.
- Lehrer, R., & Schauble, L. (1999, April). *What counts as different? Reasoning about distributions and difference in the fifth grade*. In N.D. Enyedy (Chair), *Stochastics: Improving student understanding of probability and statistics through the use of technology*. Symposium conducted at the annual meeting of the American Educational Research Association, Montreal, Canada.

- Strom, D., & Lehrer, R. (1999, April). *The epistemology of generalization*. In J. Kaput (Chair), *Toward a research base for algebra reform beginning in the early grades*. Symposium conducted at the annual meeting of the American Educational Research Association, Montreal, Canada.
- Lehrer, R., & Schauble, L. (1998, August). *Data modeling*. In R. Lehrer (Chair), *Modeling in Mathematics and Science Education*. Tutorial presented at the annual meeting of the Cognitive Science Society, Madison, WI.
- Battista, M. & Lehrer, R. (1998, July). *Investigating student thinking about the mathematics of space and geometry*. Invited presentation at the Institute for Advanced Study-Mathematics Institute, Park City, Utah.
- Lehrer, R. (1998, June). *Evolution of notation and argument*. Invited paper presented at the International Conference on Modeling and Symbolizing in Mathematics Education, Freudenthal Institute, Utrecht, Netherlands.
- Lehrer, R., & Schauble, L. (1998, June). *The interrelated development of inscriptions and conceptual understanding*. Invited presentation at the annual meeting of the Jean Piaget Society, Chicago, IL.
- Lehrer, R. (1998, May). *Mathematizing space in the primary grades*. Paper/Workshop presented at the annual Green Lake Conference of the Wisconsin Mathematics Council, Green Lake, WI.
- Lehrer, R., & Schauble, L. (1998, April). *Developing a community of practice for reform of mathematics and science*. In P. Grossman (Chair), *Researching change in teachers' professional communities: Methodological and theoretical dilemmas*. Symposium conducted at the annual meeting of the American Educational Research Association, San Diego, CA.
- Lehrer, R., & Schauble, L. (1998, April). *Inventing data structures for representational purposes: Elementary-grade students' classification models*. In L. Schauble (Chair), *Challenges and opportunities of a modeling curriculum*. Symposium conducted at the annual meeting of the American Educational Research Association, San Diego, CA.
- Forman, E., Dobransky-Fasiska, D., Strom, D., & Lehrer, R. (1998, April). *Learning to participate in mathematical arguments*. In R. Lehrer (Chair), *Mathematizing space in the primary grades*. Symposium conducted at the annual meeting of the American Educational Research Association, San Diego, CA.
- Erickson, J., & Lehrer, R. (1998, April). *The evolution of critical standards as students design hypermedia documents*. In S. Williams (Chair), *Learning through Problem Solving*. Symposium conducted at the annual meeting of the American Educational Research Association, San Diego, CA.

- Erickson, J., & Lehrer, R. (1997, August). *Students' evolution of critical standards about design*. In *Psychology of Developing Software for Children*. Symposium conducted at the annual meeting of the American Psychological Association, Chicago, IL.
- Lehrer, R., & Schauble, L. (1997, April). *The inter-related development of inscriptions and conceptual understanding*. In D. Klahr (Organizer), *Multiple-Space Search in Scientific Reasoning: Developmental Implications*. Symposium conducted at the Society for Research in Child Development, Washington, D.C.
- Lehrer, R., & Schauble, L. (1996, September). *The development of model-based reasoning*. Invited presentation to the Committee in Development in the Sciences of Learning, National Academy of Sciences National Research Council, Washington, D.C.
- Shumow, L.B., & Lehrer, R. (1996, April). *Effects of a parent education program about children's problem solving in the context of mathematics reform*. In R. Elardo (Chair), *Parent Involvement Activities and Effects*, Symposium conducted at the American Educational Research Association, New York, NY.
- Penner, D., Giles, N., Lehrer, R., Schauble, L. (1996, April). *Building functional models: Designing an elbow*. In Susan William (Chair) *Learning Through Design: Contextualizing Inquiry for Science and Mathematics*, Symposium conducted at the American Educational Research Association, New York, NY.
- Lehrer, R., Shumow, L. B., Thoyre, G., & Kemeny, V. (1996, April). *Constructing the mathematical self*. In Teresa Garcia (Chair) *Student Beliefs, Self-Processes and Self-Regulated Learning*, Poster session presented at American Educational Research Association, New York, NY.
- Lehrer, R., & Schauble, L. (1996, April). *The development of model-based reasoning in mathematics and science*. In Richard Duschl and Kathleen Metz, (Co-chairs), *Design Experiments in Children's Science Education*. Symposium conducted at the American Educational Research Association, New York, NY.
- Lehrer, R., Kemeny, V., & Gance, S. (1996, April). *Children model the structure of space: From cereal boxes to epistemology*. In Carol Kehr Tittle (Chair), *Evaluating Mathematics and Science Reform in School Classrooms: The Role of Theories in Frameworks for Evaluation*. Symposium conducted at American Educational Research Association, New York, NY.
- Lehrer, R., & Jacobson, C. (1996, April). *Modeling to reform teaching and learning in mathematics and science*. Invited address, Schools in the 21st Century, San Antonio, TX.
- Lehrer, R., & Romberg, T. (1995, October). *Mathematizing children's informal understanding of space*. Presented at ICMI Study Group, Perspectives on the Teaching of Geometry for the 21st Century, Catania, Italy.
- Schauble, L., & Lehrer, R. (1995, April). *Thinking about simple machines: Model-based reasoning in design contexts*. In E. D. Amsel (Chair), *The development of scientific*

- reasoning*. Symposium conducted at the Biennial Meeting of the Society for Research in Child Development, Indianapolis, IN.
- Schauble, L., & Lehrer, R. (1995, April). *The development of model-based reasoning*. Paper presented at the Annual Meeting of the National Association of Research on Science Teaching, San Francisco, CA.
- Lehrer, R., & Erickson, J. (1995, April). *Contextual considerations for technology-aided learning*. In Michael Pressley (Chair), *Psychological Learning Issues in Technology-Based Learning Environments*, Symposium conducted at the American Educational Research Association, San Francisco, CA.
- Lehrer, R., & Jacobson, C. (1995, April). *Classical and classroom views of the development of spatial thinking*. Paper presented at the American Educational Research Association, San Francisco, CA.
- Lehrer, R., & Shumow, L. B. (1995, April). *Aligning the construction zones of parents and teachers: The case of mathematics reform*. Paper presented at the American Educational Research Association, San Francisco, CA.
- Lehrer, R. (1994, June). *Geometry in the primary grades?* Invited paper presented at the Project for the Improvement of Mathematics Conference, Marquette University, Milwaukee, WI.
- Lehrer, R., & Schauble, L. (1994, April). *The embedded history of classroom learning*. In Ellice Forman (Chair), *Integrating the cognitive and the social in the construction of mathematical and scientific knowledge*. Symposium conducted at the American Educational Research Association, New Orleans, LA.
- Lehrer, R. (1994, April). *Teaching geometry for understanding*. Paper presented at the annual meeting of the National Council for Teachers of Mathematics, Indianapolis, IN.
- Lehrer, R. (1994, April). *New directions for teaching and learning geometry*. Symposium chair and organizer. American Educational Research Association, New Orleans, LA.
- Jacobson, C., Potts, M., & Lehrer, R. (1994, April). Cognitively guided instruction in geometry: Informed discourse, the window into the why. In *New Directions for Teaching and Learning Geometry*. Symposium conducted at the American Educational Research Association, New Orleans, LA.
- Lehrer, R., & Shumow, L. (1993, April). Teaching as assisted performance: Comparing the construction zones of parents and teachers. In *Bridging the Gap between Radical Constructivism and Cognitive Theory*. Symposium conducted at the American Educational Research Association, Atlanta, GA.
- Lehrer, R., Osana, H., Jacobson, C., & Jenkins, M. (1993, April). *Children's conceptions of geometry in the primary grades*. Paper presented at the American Educational Research Association, Atlanta, GA.

- Lehrer, R., & Horvath, J. (1993, April). Cognitive models of authentic assessment. In *Moving beyond the Rhetoric about Authentic Assessment in Mathematics*. Symposium conducted at the American Educational Research Association, Atlanta, GA.
- Lehrer, R., Erickson, J., & Connell, T. (1993, April). The restless text. Student authoring with hypermedia tools. In *Learner Interactions in the New Electronic Writing Space*. Symposium conducted at the American Educational Research Association, Atlanta, GA.
- Jeong, A., & Lehrer, R. (1993, April). *Teaching kinematics and graph interpretation with computer simulations and dynamic notations*. Paper presented at the American Educational Research Association, Atlanta, GA.
- Towell, G., & Lehrer, R. (1992, December). *A knowledge-based model of geometry learning*. Paper presented at the Sixth Annual Neural Information Processing Systems Natural and Synthetic, Denver, CO.
- Lehrer, R. (1992, August). *Back to the future: Logo and the development of spatial sense*. Paper presented at the 7th International Congress for Mathematics Research, Quebec City, Canada.
- Reynolds, T., Bonk, C., & Lehrer, R. (1992, April). *Conceptual change from essay and summary writing in eighth-grade social studies*. Paper presented at the American Educational Research Association, San Francisco, CA.
- Lehrer, R., Erickson, J., & Connell, T. (1992, April). A researcher's approach to assessing knowledge design in history. In *Assessing Cognitive skills as Students Design Multimedia Presentations: Teacher and Researcher Perspectives*. Symposium presented at the American Educational Research Association, San Francisco, CA.
- Lehrer, R. (1992, March). *Learning by design*. Invited presentation at the Robert M. LaFollette Institute of Public Affairs, Madison, WI.
- Littlefield, J., & Lehrer, R. (1991, April). *A model of the cognitive components of Logo: Implications for performance and transfer*. Society for Research in Child Development, Seattle, WA.
- Lehrer, R., Lee, A., & Jeong, A. (1991, April). *Reflective teaching of Logo*. American Educational Research Association, Chicago, IL.
- Lehrer, R. (1991, April). *History by design*. American Educational Research Association, Chicago, IL.
- Loef, M., & Lehrer, R. (1990, April). *Understanding of teachers' knowledge of fractions*. American Educational Research Association, Boston, MA.
- Lehrer, R., & Yussen, S. R. (1990, April). *Computer experience and children's theories of mind*. American Educational Research Association, Boston, MA.

- Lehrer, R., & Littlefield, J. (1990, April). *Changes across time in the cognitive structure of Logo knowledge*. American Educational Research Association, Boston, MA.
- Lehrer, R., & Yussen, S.R. (1989, April). *Children and adolescents' conceptions of computer and human intelligences*. Society for Research in Child Development, Kansas City, MO.
- Lehrer, R., Knight, W., Sancilio, L., & Love, M. (1989, March). *Software to link actions and descriptions in pre-proof geometry*. American Educational Research Association, San Francisco, CA.
- Lehrer, R., & Littlefield, J. (1989, March). *Misconceptions in Logo: The role of instruction*. American Educational Research Association, San Francisco, CA.
- Rembold, K. L., & Lehrer, R. (1988, August). *The development of young children's choices in analogical problem solving*. American Psychological Association, Atlanta, GA.
- Lehrer, R., & Yussen, S. (1988, April). *Conceptions of computer and human intelligence*. In *Children's and Adult's Conceptions of Mental Processes and Events*, Symposium conducted at the American Educational Research Association, New Orleans, LA.
- Lehrer, R., Randle, L., & Sancilio, L. (1988, April). *Learning pre-proof geometry with Logo*. American Educational Research Association, New Orleans, LA.
- Lehrer, R., & Koedinger, K. (1988, April). *Cognitive structure by fuzzy induction*. American Educational Research Association, New Orleans, LA.
- Lehrer, R., & Guckenberger, R. (1988, April). *Children's perceptions of educational software: Theory and methods*. American Educational Research Association, New Orleans, LA.
- Lehrer, R. (1988, November). *Linking action and description in pre-proof geometry*. Invited paper presented at the annual meeting of the Psychology of Mathematics Education (PME), Dekalb, IL.
- Lehrer, R. (1988, April). *Logo and pre-proof geometry: The Meno revisited*. In *Learning of geometry through Logo: Three perspectives*, Research symposium sponsored by the Research Advisory Committee of National Council of Teachers of Mathematics, Chicago, IL.
- Lehrer, R., & Randle, L. (1987, May). *Turtle for two: Collective Logo*. Paper presented at the annual meeting of the Piaget Society, Philadelphia, PA.
- Lehrer, R., Guckenberger, T., & Lee, O. (1987, April). *A comparative study of the cognitive consequences of Logo-guided instruction in the third grade*. American Educational Research Association, Washington, D.C.
- Lehrer, R., & Comeaux, M. (1987, April). *A developmental study of the effects of goal constraints on composition*. American Educational Research Association, Washington, D.C.

- Lehrer, R. (1987, July). *Robots as tools for thought*. Invited presentation at the Schoolhouse Robotics Conference, Madison, WI.
- Lehrer, R. (1987, June). *A fool's commentary*. Invited discussant for the NSF Working Conference in Geometry, Syracuse, NY.
- Lehrer, R., & Smith, P. C. (1986, April). Logo learning: Are two heads better than one? In *Effects of Logo-Mediated Instruction in Mathematics and Problem Solving*, Symposium conducted at the American Educational Research Association, San Francisco, CA.
- Lehrer, R., & Smith, P. C. (1986, April). Logo learning: Is more better? In *Effects of Logo-Mediated Instruction in Mathematics and Problem Solving*, Symposium conducted at the American Educational Research Association, San Francisco, CA.
- Lehrer, R., Levin, B. B., Comeaux, M., & DeHart, P. (1986, April). *Writing scaffolds for young children: A comparative study*. American Educational Research Association, San Francisco, CA.
- Lehrer, R. (1986, October). *New information technologies and the social sciences: The human element*. Paper presented at the Laser Active '86: Interactive Information Technologies-Challenges and Applications for Education, Research and Training. Boston, MA.
- Comeaux, M., & Lehrer, R. (1986, April). *The mind of a writer: A cognitive model of computer-assisted composition*. American Educational Research Association, San Francisco, CA.
- Lehrer, R., Harckham, L., & Archer, P. (1985, April). *Microcomputer-based instruction for special needs children: First year findings*. American Educational Research Association, Chicago, IL.
- Lehrer, R., & DeBernard, A. (1985, April). *The language of learning and the language of computing: The perceptual-language model*. American Educational Research Association, Chicago, IL.
- Lehrer, R. (1984, October). *A cognitive-distancing model for microcomputer-based instruction*. Northeast Educational Research Association, Ellenville, NY.
- Lehrer, R. (1984, April). *Generalized discriminant analysis via Bayesian regression with structural priors*. American Educational Research Association, New Orleans, LA.
- Hess, A. M., & Lehrer, R. (1984, April). *A causal model of cognitive processes and reading comprehension*. American Educational Research Association, New Orleans, LA.
- Lehrer, R. (1983, April). *Novice problem solving skills: Relations among formal operations, representation, and performance*. American Educational Research Association, Montreal, Canada.
- Eimer, B. N., Mancuso, J. C., & Lehrer, R. (1983, April). *Developmental differences in boys' judgments about parental disciplinary behavior*. Society for Research in Child Development, Detroit, MI.

- Lehrer, R. (1982, August). *A features model of friendship*. Paper presented at the annual meeting of the American Psychological Association, Washington, D. C.
- Simon, J., Larsen, C., & Lehrer, R. (1982, March). *Preschool developmental screening program: The relationship between audiometric measures to performance on cognitive and language tasks*. New England Research Organization, Amherst, MA. Received best paper award. Also an invited presentation for distinguished papers from the Regional Research Associations at American Educational Research Association, New York.
- Lehrer, R. (1982, March). *A chronometric analysis of the acquisition of cognitive structure*. American Educational Research Association, New York City.
- Lehrer R., & Pruzek, R. M. (1981, April). *Item domains as fuzzy sets: Judgmental and response data correspondence*. American Educational Research Association, Los Angeles, CA.
- Lehrer, R., Heinegg, R., & Clark, C. (1981, April). *The child's concept of the present*. Society for Research in Child Development, Boston, MA.
- Lehrer, R. (1981, April). *Assessing developmental hypotheses with cross classified data: Log linear models*. American Educational Research Association, Los Angeles, CA.
- Lehrer, R., & Rabinowitz, S. N. (1980, April). *A comparison of methods for the assessment of group and individual cognitive structure*. American Educational Research Association, Boston, MA.
- Pruzek, R. M., & Lehrer, R. (1979, April). *Generalized canonical analysis of relationships among qualitative variables*. American Educational Research Association, San Francisco, CA.