

Leona Schauble

Department of Teaching and Learning
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Current Appointment: Professor of Education, Department of Teaching and Learning

Areas of Specialization

The development of everyday and scientific thinking, including experimentation strategies, conceptual change, and model-based reasoning; causal inference; reasoning heuristics and errors; problem solving; relation between content knowledge and general processes of inference and induction. Science and mathematics education; school reform; the professional development of educators, learning in out of school contexts.

Education

- 1987-1989: Postdoctoral Fellow, Learning Research and Development Center,
University of Pittsburgh, Pittsburgh, PA
- May, 1988: Ph.D., Developmental and Educational Psychology
Columbia University, New York, NY
- May, 1981: M.A., Developmental Psychology
Teachers College, Columbia University, New York, NY
- May, 1968: A.B., Bates College, Lewiston, ME

Professional Experience

- Present: Professor of Education, Department of Teaching and Learning
Vanderbilt University
- 2000-2002 Professor, University of Wisconsin-Madison
- 1996-2000 Associate Professor, University of Wisconsin-Madison
- 1992-1996 Assistant Professor, Department of Educational Psychology
University of Wisconsin-Madison
- 1989-1992: Research Scientist, Learning Research and Development Center,
University of Pittsburgh

- 1985-present: Consultant, Children's Television Workshop, New York, NY
 Developed proposals and prototypes for research experiments in the new technologies to education. Designed and carried out an evaluation of *Mathnet*, a central format in CTW's series on mathematics, *Square One Television*. Helped to design a new interactive pointing device copyrighted for use in educational technology for preschoolers. Served on national board of research advisors for the development of *Cro*, an animated series based on David Macaulay's book, *The Way Things Work* (to develop children's understanding of machines and technology). Occasional advisor to CTW on children's cognitive development and science learning.
- 1984-1986: Research Assistant with Dr. Sylvia Scribner on project studying notation, representation, and reasoning in workplace settings, City University Graduate Center, New York, NY
- 1984-1986: Research Assistant with Dr. Deanna Kuhn on project studying everyday reasoning and argumentation, Columbia University, New York, NY
- 1980-1984: Director of Research and Development, Children's Computer Workshop, New York, NY
 Planned and implemented research policies and programs for an interdisciplinary team developing educational applications of interactive technologies. Hired and supervised staff of eight full-time researchers.
- 1978-1980: Associate Director of Research for *Sesame Street*
 Children's Television Workshop, New York, NY
 Planned and carried out research on *Sesame Street*, an experimental educational television program for preschoolers. Developed curriculum and helped to guide the educational design of the series, as well as other national and international educational television programs for children and adults. Planned and carried out research and design on other educational media: books, toys, museum displays, computer galleries, games, software, puzzles, magazines, and activity kits.
- 1969-1980: Researcher and Field Research Coordinator for *Sesame Street*
 Children's Television Workshop
- 1968-1969: Technical Writer, Burlington Management Services Company, NY, NY

Editorial and Other Professional Responsibilities

- 2007-current *Executive editor, Cognition and Instruction.*
 1992-1997 *Co-editor (with Isabel Beck), Cognition and Instruction*

Reviewer for: *American Educational Research Journal, British Journal of Developmental Psychology, Child Development, Cognitive Psychology, Developmental Psychology, Educational Researcher, Human Development, Journal of Educational Psychology, Journal of Experimental Child Psychology, Journal for Research in Science Teaching, Learning and Instruction, Review of Educational Research, Science Education*

- 1993-1995: AERA's Palmer O. Johnson Memorial Award Committee; 1994-95, Chair.
 1995-1996: AERA Annual Meeting Program Committee (Assistant Chair of Division C, Section 3: Science Learning)
 1996-1997: AERA's Committee to select recipient of annual Distinguished Contributions to Educational Research Award
 1998-1999: AERA Publications Committee
 2003-2004 National Research Council Strategic Educational Research Partnership Panel on Learning and Instruction
 2004-2005 National Research Council Panel on Science Learning K-8
 2005-2008 IES Standing Panel for Mathematics/Science

Honors and Awards

- 1988: Miriam Levin Goldberg Dissertation Award, Teachers College, Columbia University
 1991-92: National Academy of Education Spencer Fellowship
 1996: AERA Raymond B. Cattell Early Career Award

Research and Publications

Publications in Refereed Journals (*Schauble and Lehrer's contributions to publications marked with an asterisk were written with equal contribution; order of authorship is determined solely by alphabetical priority.)

Schauble, L. (1990). Belief revision in children: The role of prior knowledge and strategies for generating evidence. *Journal of Experimental Child Psychology*, 49(1), 31-57.

Schauble, L., Glaser, R., Raghavan, K., & Reiner, M. (1991). Causal models and experimentation strategies in scientific reasoning. *Journal of the Learning Sciences*, 1 (2), 201-238.

Schauble, L., Klopfer, L. E., & Raghavan, K. (1991). Students' transition from an engineering model to a science model of experimentation. *Journal of Research in Science Teaching*, 28(9), 859-882.

Schauble, L., Glaser, R., Raghavan, K., & Reiner, M. (1992). The integration of knowledge and experimentation strategies in understanding a physical system. *Applied Cognitive Psychology*, 6, 321-343.

Kuhn, D., Schauble, L., & Garcia-Mila, M. (1992). Cross-domain development of scientific reasoning. *Cognition and Instruction*, 9, 285-327.

Braine, L., G., Schauble, L., Kugelmass, S., & Fell, A. (1993). The representation of depth by children: Spatial strategies and lateral biases. *Developmental Psychology*, 29(3), 466-479.

Lehrer, R., Horvath, J., & Schauble, L. (1994). Developing model-based reasoning. *Interactive Learning Environments*. 4(3), 218-232.

Schauble, L., Glaser, R., Duschl, R., Schulze, S., & John, J. (1995). Students' understanding of the objectives and procedures of experimentation in the science classroom. *Journal of the Learning Sciences*, 4(2), 131-166.

Derry, S., Levin, J. R., & Schauble, L. (1995). Stimulating statistical thinking through situated simulations. *Teaching of Psychology*.

Schauble, L. (1996). The development of scientific reasoning in knowledge-rich contexts. *Developmental Psychology*. 32(1), 102-119.

Penner, D., Giles, N. D., Lehrer, R., & Schauble, L.* (1997). Building functional models: Designing an elbow. *Journal of Research in Science Teaching*, 34 (2), 125-143.

Schauble, L., & Bartlett, K. (1997). Constructing a science gallery for children and families: The role of research in an innovative design process. *Science Education*, 81(6), 781-793.

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.

Schauble, L., Leinhardt, G., & Martin, L. (1998). Organizing a cumulative research agenda in informal learning contexts. *Journal of Museum Education*, 22(2 & 3), 3-7.

Penner, D.E., Lehrer, R., & Schauble, L.* (1998). From physical models to biomechanical systems: A design-based modeling approach. *Journal of the Learning Sciences*, 7(3&4), 429-449.

Gleason, M. E., & Schauble, L. (1999). Parents' assistance of their children's scientific reasoning. *Cognition and Instruction*, 17(4), 343-378.

Lehrer, R., & Schauble, L.* (2000). The development of model-based reasoning. *Journal of Applied Developmental Psychology*, 21(1), 39-48.

Lehrer, R., & Schauble, L.* (2000). Inventing data structures for representational purposes: Elementary grade students' classification models. *Mathematical Thinking and Learning*, 2(1&2), 51-74.

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. *Educational Researcher*, 32(1), 9-13.

Lehrer, R., & Schauble, L.* (2004). Modeling natural variation through distribution. *American Educational Research Journal*. 41(3), 635-679.

Lehrer, R., Kim, M., & Schauble, L. (2007). Supporting the development of conceptions of statistics by engaging students in modeling and measuring variability. *International Journal of Computers for Mathematics Learning*, 12, 195-216.

Lehrer, R., Schauble, L., & Lucas, D.* (2008). Supporting development of the epistemology of inquiry. *Cognitive Development*, 23 (4), 512-529.

Books

Schauble, L., & Glaser, R., Eds. (1996). *Innovations in learning: New environments in education*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Lehrer, R., & Schauble, L., Eds.* (2001). *Investigating real data in the classroom: Expanding children's understanding of math and science*. New York: Teachers College Press.

National Research Council (2006). *Taking science to school* (Washington, DC: National Academy Press).

Chapters (*Schauble and Lehrer's contributions to publications marked with an asterisk were written with equal contribution; order of authorship is determined solely by alphabetical priority.)

Kuhn, D., Amsel, E., & O'Loughlin, M., with L. Schauble & W. Yotive (1988). *The development of scientific thinking skills*. NY: Academic Press.

Schauble, L. (1990). Formative evaluation in the design of educational software. In B.N. Flagg (Ed.), *Improving electronic learning materials through formative evaluation*. (pp. 51-66). Hillsdale, NJ: Erlbaum.

Schauble, L., & Glaser, R. (1990). Scientific thinking in children and adults. In D. Kuhn (Ed.), *Developmental perspectives on teaching and learning thinking skills*. *Contributions to Human Development*, 21, 9-26.

Voss, J. F., and Schauble, L. (1992). Is interest educationally interesting? An interest-related model of learning. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 101-120). Hillsdale, NJ: Erlbaum.

Glaser, R., Schauble, L., Raghavan, K., & Zeitz, C. (1992). Scientific reasoning across different domains. In E. DeCorte, M. Linn, H. Mandl, & L. Verschaffel, (Eds.), *Computer-based learning environments and problem solving* (pp. 345-371). Berlin: Springer-Verlag.

Schauble, L., Raghavan, K., & Glaser, R. (1993). The Discovery and Reflection Notation: A graphical trace for supporting self regulation in computer-based laboratories. In S. LaJoie & S. Derry (Eds.), *Computers as Cognitive Tools* (pp. 319-337). Hillsdale, NJ: Lawrence Erlbaum Associates.

Schauble, L., Beane, D. B., Coates, G. D., Martin, L. M. W., & Sterling, P. (1996). Outside the classroom walls: Learning in informal environments. In L. Schauble and R. Glaser (Eds.), *Innovations in learning: New environments for education* (pp 5-24) Hillsdale, NJ: Lawrence Erlbaum Associates.

Lehrer, R., Schauble, L.,* Carpenter, S., & Penner, D. (2000). The inter-related development of inscriptions and conceptual understanding. In P. Cobb, E. Yackel, and K. McClain (Eds.), *Symbolizing and communicating in mathematics classrooms: Perspectives on discourse, tools, and instructional design* (pp. 325-360). Mahwah, NJ: Erlbaum.

Lehrer, R., & Schauble, L.* (2000). Model-based reasoning in mathematics and science. In R. Glaser, *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 R. Minstrell and E. Van Zee (Eds.), *Inquiring into inquiry learning and teaching in science* (pp. 80-99). Reston, VA: American Association for the Advancement of Science.

Schauble, L., Leinhardt, G., & Martin, L. (2000). A framework for organizing a cumulative research agenda in informal learning contexts. In J. S. Hirsch & L. H. Silverman (Eds.), *Transforming practice*. Washington, D.C.: Museum Education Roundtable.

Lehrer, R., Schauble, L., & Petrosino, A. J.* (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. 251-277). Mahwah, NJ: Lawrence Erlbaum Associates.

Lehrer, R., & Schauble, L.* (2001). Similarity of form and substance: From inscriptions to models. In D. Klahr & S. Carver (Eds.), *Cognition and instruction: 25 years of progress* (pp. 39-74). Mahwah, NJ: Lawrence Erlbaum Associates.

Lehrer, R., & Schauble, L.* (2002). Symbolic communication in mathematics and science: Co-constituting inscription and thought. In J. Byrnes & E.D. Amsel (Eds.), *Language, literacy, and cognitive development: The development and consequences of symbolic communication* (pp. 167- 192). Mahwah, NJ: Lawrence Erlbaum Associates.

Schauble, L., Gleason, M., Lehrer, R., Bartlett, K., Petrosino, A., Allen, A., Clinton, C., Ho, E., Jones, M., Lee, Y., Phillips, J., Siegler, J., & Street, J. (2002). Supporting science learning in museums. In G. Leinhardt., K. Crowley, & K. Knutson. (Eds.) *Learning conversations: Explanation and identity in museums* (pp. 425-452). Mahwah, NJ: Lawrence Erlbaum Associates.

Schauble, L. (2002). Cloaking objects in epistemological practices. In S. G. Paris (Ed.), *Perspectives on object-centered learning in museums* (pp. 235-241). Mahwah, NJ: Lawrence Erlbaum Associates.

Lehrer, R., & Schauble, L. (2003).* Origins and evolution of model-based reasoning in mathematics and science. In H. Doerr and R. Lesh (Eds.), *Beyond constructivism: A models and modeling perspective*. Mahwah, NJ: Lawrence Erlbaum Associates.

Hall, R., Lehrer, R., Lucas, D., & Schauble, L. (2004). Of grids and jars: A comparative analysis of representational infrastructure and learning opportunities in middle school and professional science. In Y. Kafai, W. Sandoval, n. Enyedy, A. Nixon, & F. Herrera (Eds.) *Proceedings of the sixth international Conference of the Learning Sciences*. Mahwah, NJ: Lawrence Erlbaum Associates.

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. 29-54). Mahwah, NJ: Lawrence Erlbaum Associates.

Lehrer, R., & Schauble, L. (2006). Scientific thinking and science literacy. In W. Damon, R. Lerner, K.A. Renninger, and I. E. Sigel, Eds. *Handbook of child psychology, 6th Edition, Volume 4: Child psychology in practice* (pp. 153-196). Hoboken, NJ: John Wiley and Sons.

Lehrer, R., & Schauble, L. (2006). Cultivating model-based reasoning in science education. In K. Sawyer (Ed.), *Cambridge handbook of the learning sciences* (pp. 371-388). Cambridge, MA: Cambridge University Press.

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). Mahwah, NJ: Lawrence Erlbaum Associates.

Schauble, L. (2008). Three questions about development. In R. A. Duschl & R.E. Grandy (Eds.), *Teaching scientific inquiry: Recommendations for research and application* (pp. 50-56). Rotterdam, NL: Sense Publishers.

Lehrer, R., & Schauble, L.* (submitted). What kind of explanation is a model? In M.K. Stein (Ed.), *Instructional Explanations in the Disciplines*.

Schauble, L. (in press). The work of constructing connections between research and practice: What we can learn from Isabel Beck. In M. McKeown and L. Kucan, *Bringing reading researchers to life: Essays in honor of Isabel Beck*. New York: Guilford Press.

Reviews, Proceedings, and Comments

Schauble, L. (1985). The feasibility of a developmental cognitive science: A response to Pea and Kurland. *New Ideas in Psychology*, 2(2), 181-183.

Glaser, R., Raghavan, K. & Schauble, L. (1988). Voltaville, a discovery environment to explore the laws of DC circuits. *Proceedings of the International Conference on Intelligent Tutoring Systems*. Montreal, Canada: University of Montreal.

Mukhopadhyay, S., Resnick, L. B., and Schauble, L. (1990). Social sense-making in mathematics: Children's ideas of negative numbers. *Proceedings of the Psychology in Mathematics Education Conference*, Mexico City, Mexico.

Schauble, L. (1991). Playing with matches. (Invited book review of Vosniadou, S., & Ortony, A., Eds., 1989, *Similarity and analogical reasoning*). *Educational Researcher*, 20(9), 21-22.

Schauble, L. (1993). Where have all the learners gone? (Invited book review of Goodyear, P., Ed., 1991, *Teaching knowledge and intelligent tutoring*, Norwood, NJ: Ablex Publishing). *Educational Computing Research*, 8(4), 541-546.

Schauble, L. (1994). Modularity, representational redescription, and beyond. (Invited book review of A. Karmiloff-Smith, 1992, *Beyond modularity*, Cambridge, MA: The MIT Press). *Human Development*, 37 (319-322).

Schauble, L. (1996). Are schools stalling out? (Invited book review of Shank, R. C. & Cleary, C. *Engines for education*, Hillsdale, NJ: Erlbaum). *Journal of Educational Computing Research*, 14(3), 305-310.

Schauble, L. (1997). A little constructive criticism of constructivism. Critique of D. C. Phillips, How, why, what, when, and where: Perspectives on constructivism in psychology and education. *Issues in Education: Contributions from Educational Psychology*, 3(2), 357-261.

Schauble, L. (in press). Thinking about thinking. Commentary for *Contemporary Psychology* on D. R. Olson & N. Torrance (Eds.). *Modes of thought: Explorations in culture and cognition*. Cambridge, Eng.: Cambridge University Press.

Schauble, L. (1999). Syntax or substance? What is scientific reasoning? Commentary for *Human Development* on B. Koslowski. *Theory and evidence: The development of scientific reasoning*. Cambridge, MA: The MIT Press. *Human Development*, 42: 278-281.

Schauble, L. (2003). Scientific thinking: More on what develops. *Human Development*. 46:155-160.

Grants and Funded Research (*Schauble and Lehrer's contributions to these projects were equal; order of authorship is determined by alphabetical priority).

- 1991-92: Schauble, L. Goals and Strategies of Scientific Experimentation, National Academy of Education Spencer Fellowship
- 1993-94: Schauble, L. Studying the Development of Scientific Experimentation Strategies in Museums, University of Wisconsin Graduate School Research Award
- 1993-95: University Sponsor for David Penner, James. S. McDonnell Foundation CSEP Postdoctoral Fellow
- 1994-97: Schauble, L. Children's Museum of Indianapolis, Research for children's science gallery funded by the National Science Foundation
- 1994-97: Richard Lehrer & Leona Schauble*, Thinking About Simple Machines: Model-Based Reasoning in Design Contexts, National Science Foundation
- 1995-98: Richard Lehrer and Leona Schauble*, Building Bridges Between Mathematics and Science, James S. McDonnell Foundation Cognitive Studies in Educational Practice Program
- 1998-2003 Richard:Lehrer and Leona Schauble*, Elementary Design Collaborative, National Center for Improving Student Learning in Mathematics and Science. Office of Education Research and Improvement.
- 1999-2002 Leona Schauble and Richard Lehrer*. Modeling Nature. National Science Foundation.
- 2004-06 Richard Lehrer, Pat Thompson, Rogers Hall, Kay McClain, Leona Schauble, Mark Wilson, and Clifford Konold. Constructing data, modeling worlds: Collaborative investigation of statistical reasoning. National Science Foundation. (My role was to serve as one of the co-authors and to assist in the professional development efforts of the project).
- 2006-2010 Marcy Singer-Gabella and Jennifer Cartier, PIs. Linking teacher preparation to student learning in mathematics and science. (Co-author of the proposal with Marcy and Rich; serving as one of senior personnel on the research team).

- 2006-2009 Schauble, L., and Lehrer, R.* Supporting the development of model-based reasoning. National Science Foundation. (Co-author, PI)
- 2006-2009 Lehrer, R., and Schauble, L. Assessing data modeling. Institute of Education Sciences (Co-author, co-PI)

Teaching

Student Teaching Ratings for 2007-2008 Academic Year:

| Item number: | #4 | #7 | #9 |
|---|-------------|-------------|-------------|
| Fall 2007: EDUC 3900 Cognitive Development & Learning (Graduate class, 13 enrolled – 11 responding) | 4.36 (0.85) | 4.25 (0.82) | 4.00 (0.70) |
| Spring 2008: MTED 2150 Teaching Mathematics to Young Children (Undergraduates, 9 enrolled – 7 responding) | 4.50 (0.5) | 4.00 (0.57) | 4.00 (0.57) |
| Department averages for Undergraduates | 3.94 (0.87) | 3.54 (0.97) | 3.58 (0.99) |
| Fall 2008: EDUC 3900 Scientific Writing (Graduate Class, 8 enrolled, 8 responding) | 4.50 (0.76) | 4.16 (0.89) | 4.00 (0.81) |
| Department averages for Graduates | 4.09 (0.99) | 3.85 (0.91) | 3.83 (0.92) |

Presentations (2008)

Lehrer, R., & Schauble, L. (2008, March). Development of models and modeling in the life sciences. In A. C. Alonzo & A. W. Gotwalis (Chairs), *Diverse perspectives on the development, assessment, and validation of learning progressions in science*. Session presented at the Annual Meeting of the American Educational Research Association.

Lehrer, R. & Schauble, L. (2008, May). What kind of explanation is a model? In M.K. Stein & L. Kucan (Eds.), *Instructional explanations in the disciplines*. Invited conference in honor of Gaea Leinhardt.

Lehrer, R., & Schauble, L. (2007, September). Panel presentation at NSF PI meeting.

Lehrer, R., & Schauble, L. (2008, November). Panel presentation at NSF PI meeting.

Advising (2008)

PhD Students

Nancy Morabito
Paul Weinberg
Eve Manz

PhD Committees

Gabrielle Strouse (Psychology)
 Percival Matthews (Psychology)
 Filiz Varol (Teaching & Learning)
 Charles Munter (Teaching & Learning)
 Eve Manz (Teaching and Learning)
 Nancy Morabito (Teaching & Learning)
 Min-Joung Kim (Teaching & Learning)
 Nina Knapp (Teaching & Learning)
 Nancy Morabito (Teaching & Learning)

Masters Student Advisees: 7

Undergraduate Student Advisees: 6

ServiceProfessional Field

Advisory Boards: (Michelle Phillips' project in science learning (NSF), Pittsburgh Science of Learning Center (IES), NAEP Assessment Review Team, Sue Doubler's project at Technical Education Research Center on statistics learning (NSF), Center for Science Learning in Informal Environments (NSF), Chair of LRDC Board of Visitors.

IES Mathematics and Science Standing Review Panel

IES Technology Panel Review

NSF Career Award Review Panel

Executive Editor, *Cognition and Instruction*

University, College and Department

LSI Advisory Committee

Department Director of Graduate Studies

Graduate Review Committee

Graduate Admissions Committee

Science Education Search Committee

T&L Department Chair Search Committee

Teacher Education Task Force

Council on Teacher Education

Research collaboration with David Clark, delegate from University of Melbourne

Review Committee Chair for Amy Palmeri

Mentor Committee member for Emily Shahan