

## David Hammer

Physics and Curriculum & Instruction  
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### Education

University of California, Berkeley: PhD in Science and Mathematics Education, 1991. Dissertation: "Epistemological Beliefs in Introductory Physics."  
University of California, Berkeley: MA in Physics, 1987.  
University of Massachusetts, Amherst School of Education: Summer 1983 in the Math / Science / Technology Education Project for a secondary teaching credential in mathematics (NY).  
Harvard University School of Education, Institute for Moral Education: Summer 1983.  
Princeton University: BA in Physics (*cum laude*), 1982.

### Professional employment

Associate Professor of Physics and Curriculum & Instruction (8/98 - present), University of Maryland at College Park. Director of the Science Teaching Center in the Department of Curriculum & Instruction. Courses in physics and in teacher education.  
Assistant Professor of Education (9/92-5/98), Tufts University. Designed and taught courses in science and mathematics education, and an introductory physics course titled "How to Learn Physics." Supervised student teaching. Promoted to Associate Professor with tenure, 5/98.  
Lecturer (50%) (1/91 - 6/92), Group in Science and Mathematics Education, University of California, Berkeley (UCB). Designed and taught courses in science and mathematics education.  
Post-doctoral research associate (50%) (8/91 - 8/92), for Dr. Andrea diSessa's Local Conceptual Change project, Group in Science and Mathematics Education, UCB. Conducted and analyzed clinical interviews to study physics learning.  
Research assistant (8/88 - 8/91), for Dr. Andrea diSessa's Boxer project, Group in Science and Mathematics Education, UCB. Development, implementation, and study of courses in mechanics for middle and secondary school students, using programming in Boxer.  
Visiting lecturer (November, 1990), at the Educational Research and Design Unit, RMIT Victoria University Institute of Technology in Melbourne, Australia.  
Summer faculty (Summer 1988), Physics Department, University of California, Berkeley. Physics S10 (a qualitative introduction to physics).  
Teaching Assistant (8/84 - 5/88) Physics Department. Physics 8A-B (calculus-based introduction for non-majors); Physics 137B (second semester quantum mechanics); Physics 221A-B (graduate quantum mechanics).  
Research assistant (7/85-6/87), Physics Department, UCB. Theoretical work on the solar neutrino problem (spring 87) and design of a dark matter search (fall 85); work on automated supernova search project (summer 85).  
High school teacher (9/82 - 6/84), Scarsdale Alternative School, Scarsdale Public Schools. Taught math from tenth grade algebra through BC Advanced Placement Calculus, as well as a physics course of my own design. Responsibilities also included advising, participating in the school's "Just Community" democracy, and collaborating with other teachers in developing and teaching interdisciplinary "core" curricula.

### Projects

Learning How to Learn Science: Physics for Bioscience Majors (10/00 to 9/03), with Edward F. Redish, funded by the National Science Foundation (\$941K). We are studying how to help introductory physics students become more sophisticated learners.  
Case Studies of Elementary Student Inquiry in Physical Science (6/00 to 5/03), with Emily van Zee, funded by the National Science Foundation (\$873K original funding, \$150K supplement

- awarded 1/02). We are preparing a series of written and video case studies to be used as professional development materials.
- Advancing Reforms in Science Education: Teachers' Conceptual Resources (8/96 to 6/99), funded by the MacArthur / Spencer Professional Development Research and Documentation Program (\$107K). I worked with a group of physics teachers to study the influence of various perspectives and resources on their practices.
- Teachers' Resources Network in Physics (1/95 - 6/96), part of the Teachers' Resources Network at the Center for the Development of Teaching at EDC (\$50K subcontract), funding by the Dewitt-Wallace-Reader's Digest Fund.
- Spencer Fellow (9/92 - 6/94): I studied the value of education research as providing conceptual tools for teachers, focusing in particular on the perspective of epistemological beliefs. This project involved my teaching a high school physics class, videotaping the classes for analysis, as well as working with student teachers.

## Publications

- Hammer, D. & Elby, A. (2003). Tapping students' epistemological resources. *Journal of the Learning Sciences*, **12** (1), 53-91.
- DiSessa, A., Elby, A., & Hammer, D. (2002). J's epistemological stance and strategies, in G. Sinatra (ed.), *Intentional Conceptual Change*. (pp. 237-290). Mahwah, NJ: Erlbaum.
- Hammer, D. & Elby, A. (2002). On the form of personal epistemology. In B. K. Hofer & P. R. Pintrich (Eds.), *Personal Epistemology: The Psychology of Beliefs about Knowledge and Knowing*. Mahwah, NJ: Erlbaum.
- Louca, L., Hammer, D., & Bell, M. (2002). Developmental versus context-dependant accounts of abilities for scientific inquiry: A case study of 5-6th grade student inquiry from a discussion about a dropped pendulum. In P. Bell, R. Stevens & T. Satwicz (Eds.), *Keeping Learning Complex: The Proceedings of the Fifth International Conference of the Learning Sciences* (pp. 261-267). Mahwah, NJ: Erlbaum.
- Hammer, D. & Schifter, D. (2001). Practices of inquiry in teaching and research. *Cognition and Instruction*, **19** (4), 441-478.
- Elby, A., & Hammer, D. (2001). On the substance of a sophisticated epistemology. *Science Education*, **85**(5), 554-567.
- Hammer, D. (2001). Powerful technology and powerful instruction. In T. Koschmann, R. Hall, & N. Miyake (Eds.), *CSCL2: Carrying Forward the Conversation* (pp. 399-403). Mahwah, NJ: Erlbaum.
- Hammer, D. (2000). Student resources for learning introductory physics. *American Journal of Physics, Physics Education Research Supplement*, **68** (S1), S52-59.
- Hammer, D. & Elby, A. (2000). Epistemological resources. In B. J. Fishman & S. F. O'Connor-Divelbiss (Eds.), *Proceedings of the International Conference of the Learning Sciences 2000, Ann Arbor MI.*(pp. 4-5). Mahwah, NJ: Erlbaum.
- Hammer, D. (2000). Teacher inquiry. In J. Minstrell, & E. van Zee (Eds.), *Inquiring into Inquiry Learning and Teaching in Science* (pp. 184-215). Washington DC: American Association for the Advancement of Science. (Also 1999, Center for the Development of Teaching Paper Series, Education Development Center, Newton, MA.)
- Hammer, D. (1999). Physics for First-Graders? *Science Education*, **83** (6), 797-799.
- Hammer, D. (1997). Discovery learning and discovery teaching. *Cognition and Instruction*, **15** (4), 485-529.
- Hammer, D. (1996). More than misconceptions: Multiple perspectives on student knowledge and reasoning, and an appropriate role for education research. *American Journal of Physics*, **64** (10), 1316-1325.
- Hammer, D. (1996). Misconceptions or p-prims: How may alternative perspectives of cognitive structure influence instructional perceptions and intentions? *Journal of the Learning Sciences*, **5** (2), 97-127. (Also 1995, EDC Center for the Development of Teaching Paper Series, Newton, MA.)

- Hammer, D. & DiMauro, V. (1996). Student teachers on LabNet: Linking preservice teachers with a professional community. *Electronic Journal of Science Education*, **1** (2), <http://nspweb.ed.unr.edu:443/hammer.htm>
- Hammer, D. (1995). Epistemological considerations in teaching introductory physics. *Science Education*, **79** (4), 393-413. (Also 1995, EDC Center for the Development of Teaching Paper Series, Newton, MA)
- Hammer, D. (1995). Student inquiry in a physics class discussion. *Cognition and Instruction*, **13** (3), 401-430.
- Hammer, D. (1994). Students' beliefs about conceptual knowledge in introductory physics. *International Journal of Science Education*, **16** (4), 385-403.
- Hammer, D. (1994). Epistemological beliefs in introductory physics. *Cognition and Instruction*, **12** (2), 151-183.
- Metz, K., and Hammer, D. (1993). Learning physics in a computer microworld: In what sense a world? *Interactive Learning Environments*, **3** (1), 55-76.
- Sherin, B., diSessa, A., & Hammer, D. (1993). Dynaturtle revisited: Learning physics through collaborative design of a computer model. *Interactive Learning Environments*, **3** (2), p. 91-118.
- diSessa, A., Hammer, D., Sherin, B., & Kolpakowski, T. (1991). Inventing graphing: Meta-representational expertise in children. *Journal of Mathematical Behavior*, **10**, p. 117-160.
- Hammer, D. & diSessa, A. (1990). Children are not abstractions. *The Physics Teacher*, **28**, p. 440.
- Hammer, D. (1989). Two approaches to learning physics. *The Physics Teacher*, **27**, p. 664-671.

## Meetings and colloquia

### American Association of Physics Teachers (AAPT)

- Hammer, D. (Winter, 2003). Personal epistemologies and student participation. (Invited).
- Lising, L. and Hammer, D. (Winter 2003). What contributes to shifts in elementary teacher practice?
- Hammer, D. and Redish, E. F. (Winter, 2002). Design implications of a resource-based perspective on student knowledge and reasoning.
- Hammer, D., with Louca, L. and Bell, M. (Summer, 2001). What should we see in elementary students' inquiry? (Invited).
- Otero, V, Hammer, D, May, D, and Goldberg, F. (Summer, 2001) How do we know what students are thinking? (Workshop)
- Hammer, D. (Summer 2000). Preparing teachers as diagnosticians. (Invited).
- Physics Education Research Conference, Trinity College, San Antonio, August 7-8, 1999. (Chair of planning committee.)
- Hammer, D. (Summer, 1999). Epistemological resources for learning introductory physics.
- Hammer, D. (Winter, 1998). Teacher perceptions and researcher perspectives.
- Hammer, D. (Winter, 1997). A new introductory course: "How to Learn Physics." (Invited).
- Hammer, D. (Winter, 1997). Snippets and perspectives: conversations among physics teachers.
- Hammer, D. (Winter, 1996). The contributions of education research to physics instruction. (Invited).
- Hammer, D. (Winter, 1995). Epistemological considerations in teaching introductory physics.
- Hammer, D. (Summer, 1993). Conceptual inquiry in a physics class. (Invited)
- Allen, S. and Hammer, D. (Winter, 1991). Qualitative Video Analysis (Workshop).
- Hammer, D. (Winter, 1992) Students' beliefs about conceptual knowledge.
- Hammer, D. (Summer, 1990). Expert novices.
- Hammer, D., diSessa, A., Ploger, D., Adams, S., Sherin, B., and Kolpakowski, T. (Winter, 1990). Kinematics for sixth graders: an application of a computational medium.
- Hammer, D. (Summer, 1989). Supporting unproductive approaches to learning physics.
- Sherin, B., Hammer, D., diSessa, A., Ploger, D., Adams, S., and Kolpakowski, T. (Summer, 1990). Learning physics through programming.

### American Educational Research Association (AERA)

- Hammer, D. (2002). Epistemological resources and contexts.

- Hammer, D. (2002). Panelist for session, "'Personal Epistemology': Conflicts and Consensus in an Emerging Area of Inquiry"
- Hammer, D. (2002). Discussant for symposium, "Themes, controversies, and implications of studies relating to students' epistemologies in learning with scientific models"
- Louca, L, Bell, M., and Hammer, .D. (2002). Answers, explanations, and arguments in a 5-6th grade discussion about a dropped pendulum.
- Hammer, D. (2001). Preparing teachers as diagnosticians—the case of science.
- Hammer, D. (1999). Analogies and student inquiry.
- Hammer, D. (1999). Teacher inquiry and research on learning.
- Hammer, D. (1999). Discussant for symposium, "Assessing and changing students' epistemological beliefs about science and learning."
- Hammer, D. (1999). Discussant for symposium, "Staging, sustaining, and establishing norms: Characterizing how science teachers facilitate inquiry."
- Hammer, D. (1998). Discussant for symposium, "Reforming University Science and Math Classes: Epistemological Challenges."
- Hammer, D. (1997). Student inquiry, traditional content, and the emergent curriculum of a high school physics class.
- Hammer, D. (1997). Discussant for symposium, "Investigating the relationship between students' epistemologies of science and their learning."
- Hammer, D. (1996). The influence of perspectives from education research on physics teachers' perceptions and intentions.
- Hammer, D. (1996). How alternative perspectives on cognitive structure influence physics teachers' perceptions and intentions.
- Hammer, D. and DiMauro, V. (1996). Linking preservice teachers with a professional community.
- Hammer, D. (1995). The practical significance of a perspective on students' epistemologies.
- Hammer, D. (1994). Epistemological considerations in teaching introductory physics.
- Hammer, D. (1993). Chair and discussant of session "Meaningful science: New views for teachers and students."
- Hammer, D. (1992). Talking physics: Conceptual inquiry in a class discussion.
- Hammer, D. (1991). The role of metaknowledge in introductory physics.
- Metz, K. and Hammer, D. (1992). Problem solving in a computer microworld: Rhyme and reason in problem space shifts.
- Sherin, B., diSessa, A., and Hammer, D. (1992). Physics and the language of programming.

#### International Conference of the Learning Sciences

- Hammer, D. and Elby, A. (2000). Epistemological resources.

#### European Association for Research on Learning and Instruction (EARLI)

- Hammer, D. (1993). Conceptual inquiry in a physics class.
- Hammer, D. (1991). Students' beliefs about conceptual knowledge in introductory physics.

#### National Association for Research in Science Teaching

- Hammer, D. (1998). Discussant for symposium, "Getting Inside a Scientific Theory: Teacher Professional Development Through Inquiry."

#### Other invited seminars and colloquia

- Hammer, D. Challenging Courses and Curricula (Plenary Panel). MSP Learning Network Conference, Washington DC. January 31, 2003.
- Hammer, D. What do the students need? New York University, Department of Physics Colloquium. October 3, 2002.
- Hammer, D. and van Zee, Emily. Case studies of pre K-8 student inquiry in physical science. National Science Foundation, Directorate of Education and Human Welfare, Seminar, December 18, 2001.
- Hammer, D. Student resources for learning introductory physics. University of Maine, Department of Physics and Astronomy Colloquium. December 7, 2001.
- Hammer, D. What should we see in elementary student science inquiry? University of Maryland at College Park, Math and Science Education Seminar, November 2, 2001.
- Hammer, D. *et al* Case studies of student inquiry. Maryland Association of Science Teachers Conference, River Hill High School, Clarksville, MD, October 19, 2001.

- Hammer, D. What should we see in students' inquiry? University of Maryland-Prince George's County Professional Development School Mini-Conference, Eleanor Roosevelt High School, Greenbelt, MD, October 18, 2001.
- Hammer, D. The tension for a physics teacher between "promoting inquiry" and "covering content." National Science Teachers Association, Baltimore. November 17, 2000.
- Hammer, D. Student resources for learning introductory physics. Ohio State University, Department of Physics, Physics Education Group Seminar. March 27, 2000.
- Hammer, D. Teacher inquiry and research on learning. University of Maryland at College Park, Mathematics Education Group lunch seminar. September 17, 1999.
- Hammer, D. and Elby, A. Epistemological primitives. University of Maryland at College Park, Physics Education Research Group Seminar. February 25, 1999
- Hammer, D. An ontology of (learners') epistemologies. University of Maryland at College Park, Department of Human Development, February 17, 1999.
- Hammer, D. Teacher inquiry and education research. Northwestern University, Learning Sciences, January 22, 1999.
- Hammer, D. An appropriate role for physics education research: Multiple perspectives on student knowledge and reasoning. University of Toronto, Department of Physics Colloquium, December 3, 1998.
- Hammer, D. More than misconceptions: What physics teachers may see in their students. University of New Hampshire, Durham NH, Fall Meeting of the New England Section of the American Physical Society. October 23, 1998.
- Hammer, D. A different introduction to physics. University of Maryland at College Park, Physics Education Research Group Seminar. October 8, 1998
- Hammer, D. Coordinating student inquiry and traditional content in high school physics. University of Maryland at College Park, Department of Curriculum and Instruction Colloquium, March 31, 1998.
- Hammer, D. An appropriate role for physics education research: Multiple perspectives on students' knowledge and reasoning. University of Maryland at College Park, Department of Physics Colloquium, March 30, 1998.
- Hammer, D. The tension for a physics teacher between promoting "inquiry" and "covering content." Carnegie Mellon University, Center for Innovation in Learning Colloquium, November 21, 1997.
- Hammer, D. Research perspectives and teacher perceptions. University of Massachusetts, Amherst, Scientific Reasoning Research Institute Colloquium, April 29, 1997.
- Hammer, D. Coordinating student inquiry and traditional content in a high school physics class. Center for the Development of Teaching Sandwich Seminar, Sept. 18, 1996.
- Hammer, D. An appropriate role for physics education research: Multiple perspectives on students' knowledge and reasoning. Dickinson College Summer Seminar, "Teaching Introductory Physics Using Interactive Teaching Methods and Computers." Invited talk and workshop, June 20-21, 1996.
- Hammer, D. An appropriate role for physics education research: Multiple perspectives on students' knowledge and reasoning. Tufts University Physics Department, March 29, 1996.
- Hammer, D. Conceptual inquiry in physics class discussions. Education Development Center, March 11, 1993.
- Hammer, D. Student inquiry in a physics class. Bolt, Beranek, and Newman, seminar July 20, 1993.
- Hammer, D. Student inquiry in a physics class. Wright Center for Science Education, seminar Sept 23, 1993.
- Hammer, D. Epistemological beliefs in introductory physics. San Diego State University, Center for Research in Science and Mathematics Education Colloquium, May 8, 1992.
- Hammer, D. Epistemological beliefs in introductory physics. University of California at Berkeley, SESAME/EMST Colloquium, March 16, 1992.

#### Invited conferences

- Transfer of Knowledge Workshop, National Science Foundation, Arlington, VA, March 21-22, 2002

Physiology Educational Research Consortium "Misconceptions" Meeting, Chicago, IL, June 22-23, 2001.  
The Role of Students' Epistemologies in Learning with Models, Concord Consortium, Concord MA, June 8-9, 2001.  
PhD in Physics Education Research, North Carolina State University, Sept. 30 - Oct. 1, 1994.  
New Mechanics Conference, Tufts University August 6 - 8, 1992.  
Carleton Conference of the Introductory University Physics Project August 18-20, 1988.

## Consulting

Advisory board member (10/02-present), *Conceptual Dynamics in Complex Science Interventions*. NSF CAREER award to Bruce Sherin.  
Advisory board member (7/02 – present), *Curriculum Access System for Elementary Science*. NSF CAREER award to Elizabeth Davis.  
Physics Panel for NRC Committee on Programs for Advanced Study of Math & Science in American High Schools. 5/00 - 7/00) Reviewing AP and IB courses and examinations.  
National Board for Professional Teaching Standards (3/6-7/98, 5/1-2/98). Participated in the design of "Assessment Center" exam prompts and evaluation criteria, to be part of the National Board's Adolescence and Young Adulthood/Science Assessment.  
NASA Classroom of the Future project at Wheeling Jesuit College (2/13-16/97, 7/24-27/97). Advised on the assessment of *Astronomy Village: Investigating the Universe*.  
LabNet project at TERC (9/92 - 6/95). Contributed to discussions, by electronic mail and bulletin boards, within a national community of science and mathematics. Piloted use of LabNet in pre-service teacher education.  
Introductory University Physics Project (11/93 - 9/95). Advised on methods for analyzing data from student journals and interviews; reviewed drafts of publications.

## Honors and awards

National Academy of Education Spencer Fellow, 1992-94.  
University of California Regents Graduate Fellowship 1988-89.  
Distinguished Teaching Assistant, UCB Physics 1984-5.

## Memberships and activities

Member: American Association of Physics Teachers (AAPT), AAPT Committee on Research in Education (97-00); American Educational Research Association (AERA), AERA Divisions C (Learning and Instruction) and K (Teaching and Teacher Education), and the Special Interest Group for Education in Science and Technology.

Editorial review boards: *Science Education*, *Physics Education Research Supplement to the American Journal of Physics*, *Journal of Computers in Mathematics and Science Teaching*.

Ad Hoc Reviewing

Journals: *Cognition and Instruction*, *International Journal of Science Education*, *International Journal of Computers for Mathematical Learning*, *American Educational Research Journal*, *Reviews of Education Research*, *American Journal of Physics*; *Contemporary Educational Psychology*, *Journal of Teacher Education*.

Paper series: Center for Performance Assessment Paper Series at Educational Testing Service, Center for the Development of Teaching Paper Series at the Education Development Center.

Conferences: American Educational Research Association (conference paper proposals, for Division C, in science, mathematics and technology education; Division K, in teacher thinking and education, and the Special Interest Group in Science and Technology; 1997 AERA program co-chair of Div K section on science, mathematics, and technology. ).

Foundations: National Science Foundation, Spencer Foundation.