

EDUCATION

University of Washington**Seattle, Washington***Ph.D., Physics, 2001.*

Dissertation: An investigation of student understanding of basic concepts in special relativity

Supervisors: Professor Lillian C. McDermott and Professor Stamatis Vokos

*M.S., Physics, 1996.***Reed College****Portland, Oregon***B.A., Physics, 1993.***APPOINTMENTS**

University of Washington, Bothell, School of STEM**Bothell, Washington***Assistant Professor of Physics, School of STEM, December 2018 – present.***Seattle Pacific University, Department of Physics****Seattle, Washington***Senior Research Scientist, Department of Physics, July 2012 – December 2018.**Project Director and Research Director, Seattle Pacific University Energy Project, and Affiliate, Physics Department, November 2008 – July 2012.***University of Washington, Learning in Informal and Formal Environments (LIFE) Center, Seattle, WA***Visiting Scholar, October 2008 – December 2009.***University of Maryland, Department of Physics****College Park, Maryland***Research Assistant Professor, Physics Education Research Group, July 2004 – January 2010.**Postdoctoral Research Associate, Physics Education Research Group, June 2001 – June 2004.***The Evergreen State College****Olympia, Washington***Visiting faculty, September 2000 – June 2001.***University of Washington****Seattle, Washington***Research Assistant, Physics Education Group, December 1996 – September 2000.***RESEARCH EXPERIENCE**

Seattle Pacific University**Seattle, Washington***Principal investigator, “Energy and Equity: Changing the climate of secondary physics teaching and learning” (NSF DRL, \$3M), under consideration.*

Create a model for secondary science teacher professional development centered on understanding energy as a historically and politically situated science concept.

*Principal investigator, “Expanding Periscope into Biology: Video lessons for attending to student thinking in STEM” (NSF DUE, \$3M), under consideration.*Expand *Periscope* (physport.org/periscope) into STEM disciplines, beginning with biology.*Periscope* is a set of materials for university physics educator development based on compelling classroom video of best-practices university physics instruction.*Co-principal investigator, “Physics majors who want jobs: Student and faculty perspectives on career preparation in physics” (NSF EHR, \$500K), under consideration.*

Investigate both student and faculty perspectives on career preparation in physics, to learn about the departmental cultures and practices that support or hinder workforce-bound physics students.

Co-principal investigator, “University student conceptual resources for understanding physics” (NSF DUE, \$2M), under consideration.

Identify prevalent conceptual resources that students marshal to reason about physics; develop instructional materials that embed a resources orientation toward student thinking; and test the effectiveness of these instructional materials in improving students' conceptual understanding.

Principal investigator, “Understanding centrality and marginalization in undergraduate physics teaching and learning to enhance student persistence and success” (NSF DUE 1760761, \$500K), 2018-2021.

Explore the extent to which educational strategies in undergraduate physics classrooms center some students and marginalize others. Identify how educators communicate who is welcome and influential in physics and what characteristics are valued and necessary for success in physics.

Principal investigator, "Identifying best practices for inclusive physics learning environments" (NSF DUE 1611318, \$300K), 2016-2019.

Identify best practices for supporting women and minorities in physics departments; learn what physics faculty know, believe, and value that could support them in creating inclusive learning environments; and pilot resources for faculty to include more women and minorities in physics.

Co-principal investigator, "University student conceptual resources for understanding physics" (NSF DUE 1608510, \$155K), 2016-2019.

Identify prevalent conceptual resources that students marshal to reason about physics; develop instructional materials that embed a resources orientation toward student thinking; and test the effectiveness of these instructional materials in improving students' conceptual understanding.

Principal investigator, "Video resource for professional development of university physics educators" (NSF DRL 1323699, \$396K), 2013-2018.

Create and disseminate *Periscope*, a set of materials for university physics educator development based on compelling classroom video of best-practices university physics instruction.
<http://physport.org/periscope>

Co-principal investigator, "Focus on energy: Preparing elementary teachers to meet the NGSS challenge" (NSF DRL 1418211, \$518K), 2014-2018.

Develop and investigate a professional development program for elementary teachers to learn about energy and capitalize on students' productive ideas. (Collaboration with Tufts Univ.)

Senior personnel, "Assessing, validating, and developing content knowledge for teaching energy" (NSF DRL 1222777, \$821K), 2012-2016.

Develop and validate a set of coherent measures of content knowledge for teaching energy in physics. Support and evaluate teachers through professional development.

Principal investigator, "Video resource for learning assistant development" (PhysTEC, \$25K), 2011-2013.

Create a set of thematic video-based workshops that highlight key issues in physics teaching and learning, to serve as a resource for the development of learning assistants.

Co-principal investigator, "Honing diagnostic practice: Toward a new model of teacher professional preparation and development" (NSF DRL 0822342, \$3.7M), 2008-2013.

Direct investigation of the development of teacher practices of formative assessment in the context of energy. Conduct qualitative research of effective teaching and learning of energy topics. Investigate the evolution of teachers' establishment of a diagnostic learning environment in the science classroom.

Director, Energy Project Summer Research Institute, 2010-2011.

Director, Interdisciplinary Research Institute in STEM Education, 2012-2013.

Lead a multi-institution team of researcher-videographers in documenting professional development courses offered at SPU. Develop collaborations to study conceptual and pedagogical understanding of energy, learning theories, and assessment practices.

University of Maryland, Department of Physics

College Park, Maryland

Principal investigator, "Technological and educational foundations for understanding and improving large-classroom learning" (NSF IIS 0835394, \$80K), 2009-2012.

Conduct qualitative research to investigate the relationship between student behaviors and student views of knowledge and learning in lecture classrooms. Apply the results of small-scale analysis to validate large-scale computer-vision algorithms for automatic recognition of types of behavior.

Principal investigator, "Open-source physics tutorial worksheets with faculty/TA development and implementation resources" (NSF CCLI 0715567, \$260K), 2007-2009.

Develop open-source, modifiable physics tutorials focused on both conceptual and epistemological development, linked to annotated video clips of students working on the tutorials in small groups.

Principal investigator, “Developing conceptual and teaching expertise in physics graduate students: An integrated approach” (NSF REC 0529482, \$210K), 2006-2009.

Conduct basic research into the teaching practices and epistemologies of physics graduate teaching assistants in collaborative active-learning instructional environments. Develop in-depth case studies of TAs to understand what they understand about these instructional environments and their role in facilitating student learning.

Project director and co-principal investigator, “Toward a new conceptualization of what constitutes progress in learning physics, K-16” (NSF REC 0440113, \$800K), 2005-2008.

Re-conceptualize what is important for productive scientific thinking based on video case studies, construction of cognitive models, and development and application of a theoretically-grounded, empirically supported organizing framework. Identify the knowledge and abilities that children may learn in early science that can provide the foundation for success in college physics.

Co-principal investigator, “Helping students learn how to learn: Open-source physics worksheets integrated with TA development resources” (NSF CCLI 0341447, \$405K), 2004-2007.

Develop open-source, modifiable physics tutorials focused on both conceptual and epistemological development, linked to annotated video clips of students working on the tutorials in small groups.

Senior personnel, “Learning How to Learn Science: Physics for Bioscience Majors” (NSF REC 0087519, \$1M), 2001-2005.

Study college physics students’ attitudes, expectations, and epistemologies and demonstrate that they can improve in a large course. Modify existing best-practice materials for introductory university physics to promote epistemological as well as conceptual development.

Senior personnel, “Case Studies of Elementary Student Inquiry in Physical Science” (NSF ESI 9986846, \$1M), 2004-2005.

Develop a volume of written and video case studies as material to promote teachers’ substantive investigation of student inquiry in physics. Cases include the transcript, video, and/or student written work, the author’s reflections on his or her perceptions and judgments as the teacher, and insights and ideas gained from discussing the material with other teachers and researchers.

University of Washington, Department of Physics

Seattle, Washington

Research assistant, “A new model for physics education in physics departments: Improving the teaching of physics from elementary through graduate school” (NSF DUE 9354501, \$2.3M), 1996-2001.

Direct and conduct investigations of student understanding of topics in physics. Develop curriculum to address specific student difficulties. Design and perform studies to assess the effectiveness of these materials with university students. Develop and lead workshops on inquiry-based teaching materials for physics graduate students, university faculty members, and K-12 teachers.

TEACHING EXPERIENCE

University of Washington, Department of Physics

Seattle, Washington

Co-instructor, Essential Readings in Physics Education Research, Spring 2016.

Design and co-instruct a seminar in physics education research to introduce participants to the shared cultural touchstones of the field, including how PER relates to other key disciplinary perspectives. Co-taught with P. Heron, Department of Physics, University of Washington.

Seattle Pacific University, Department of Physics

Seattle, Washington

Instructor, Energy for Secondary Teachers, Summers 2013-2015.

Design and instruct a sixty-hour course summer professional development course for secondary teachers on the teaching and learning of energy, focused on energy conservation, tracking, and degradation; mechanisms of energy transfer and transformation; and representation development.

Instituto Tecnológico de Monterrey, Department of Physics **Monterrey, Mexico**

Instructor, Special Course in Qualitative Research, Spring 2011.

Design and instruct a three-day course in qualitative research for faculty, graduate students, and high school teachers, focused on the theory and practice of interaction analysis as applied to the study of physics learning.

University of Maryland, Department of Physics **College Park, Maryland**

Laboratory and tutorial instructor, Fundamentals of Physics (PHYS 121-122), Fall 2006-Spring 2007; co-instructor, Fall 2002-Spring 2006.

Supervise the laboratory/tutorial portion of a two-semester course in general physics treating the fields of mechanics, heat, sound, electricity, magnetism, optics, and modern physics. Conduct professional development for graduate teaching assistants who are the direct instructors.

Instructor, Graduate seminar in teaching physics, Fall 2006-2007; co-instructor, Fall 2001-2003.

Lead a weekly seminar designed to support and improve the teaching done by graduate teaching assistants in the physics department. Required for all departmental TAs in their first year.

Instructor, Special Problems in Advanced Physics: Physics Education Research for University Teaching (PHYS 798T), Spring 2004.

Teach a course designed to give graduate students in physics education research skills both for conducting research on the teaching and learning of physics and for applying the results of such research to classroom teaching. Topics include qualitative research methods (video and transcript analysis), quantitative research methods, and curriculum development and evaluation.

Instructor, Seminar in Teaching College Physics (PHYS 708), Fall 2002 and 2003.

Lead weekly seminar in current topics in physics education research.

The Evergreen State College **Olympia, Washington**

Visiting faculty, 2000-2001.

Team-teach full-time interdisciplinary programs that include physics, education research, and other subjects including substantial composition experience. Modify research-based physics instructional materials for use with liberal arts students.

University of Washington, Department of Physics **Seattle, Washington**

Lead teaching assistant for Department of Physics, 1998-2000.

Assist in leading weekly graduate teaching seminar for first-year graduate students, post-docs, and undergraduates. Assist faculty in administration of introductory calculus-based course. Assist in departmental and university-wide orientation programs for new TAs.

Head teaching assistant, 1995-2000.

Instruct in tutorial sections, traditional laboratories, and physics study center. Develop, modify, and assess instructional materials used in tutorials and lectures. Write exam questions and direct homework and examination grading. Supervise teaching assistants in tutorial sections.

Instructor, NSF Summer Institute for K-12 Teachers in Physics and Physical Science, 1995-1999.

Instruct in laboratory-based course to prepare K-12 teachers to teach physics and physical science using the *Physics by Inquiry* curriculum, as part of a team of instructors.

Reed College, Department of Physics **Portland, Oregon**

Lab instructor, September 1992 - May 1993.

Assist with first implementation of *Real Time Physics* in introductory laboratories. Instruct in both traditional and modified laboratories. Modify traditional lab manual.

The Exploratorium **San Francisco, California**

Explainer, Summer 1988 and 1989; Machine shop assistant, Summer 1990.

Oversee activity on the exhibit floor. Serve as a guide and facilitator, initiating contact with visitors to enrich museum experience. Perform scientific demonstrations and engage visitors in exhibits.

CONSULTING EXPERIENCE**American Physical Society****College Park, Maryland**

Evaluator, "CAMPARE and Cal-Bridge: Promoting Participation of Women and Underrepresented Students in Astronomy" (NSF PAARE 1559559, \$550K), 2016-2018; "Cal-Bridge: A California bridge to astronomy and physics PhDs for California State University and community college students" NSF S-STEM 1559559, \$730K), 2018-2023.

Evaluate efforts to recruit and place California State University undergraduates from underrepresented groups into University of California graduate programs. Student supports include mentoring, professional development, and administrative services to assist and track students.

Evaluator and researcher, "APS Bridge Program" (NSF HRD 1143070, \$3M), 2008-2019.

Offer an independent perspective on the extent to which specific Bridge sites are meeting the goal of increasing the fraction of physics PhDs awarded to underrepresented minority students to match the fraction of physics Bachelor's degrees granted to these groups. Conduct research to document physics graduate admissions practices that are designed to increase the number of women and minorities admitted to doctoral programs.

Evaluator, "Inclusive Graduate Education Network" (NSF INCLUDES 1649297, \$300K), 2016-2018.

Evaluate efforts to create a national network of physics graduate programs and faculty that take responsibility for reducing gender and racial/ethnic inequalities by building knowledge and practice about effective recruitment, admissions, and retention of women and underrepresented racial/ethnic minorities.

Evaluator, "Physics Teacher Education Coalition" (NSF PHY 0808790, \$6M) 2009-2018.

Develop evaluation tools for assessing the extent to which physics teacher education programs have the features that support the production of large numbers of highly qualified secondary physics teachers.

Evaluator, "Professional Skills Development Workshops" (NSF PHY 1419913, \$412K), 2014-2018.

Study the extent to which workshops offered by APS provide women physicists with effective negotiation and communication skills.

Researcher, "Joint Task Force on Undergraduate Physics Preparation" American Physical Society and American Association of Physics Teachers, 2015.

Interview past physics majors who now hold positions in industry, business, the military, and other non-academic professions, as well as their hiring managers, to learn how physics departments may best prepare physics majors for diverse careers.

Sustainability consultant and Formative Assessment Consultant, "Physics Teacher Education Coalition" (NSF PHY 0808790, \$6M), 2009-2014.

Observe which teacher education programs at PhysTEC legacy sites have been sustained over the years since funding and determine the mechanisms by which they have been sustained. Obtain feedback from all PhysTEC sites both on PhysTEC's overall relationship with its sites and on specific PhysTEC processes and interactions.

Researcher, "Committee on Minorities," 2013.

Interview past APS Minority Scholars to determine the extent to which the Minority Scholars program made a difference for underrepresented minority students in obtaining physics degrees.

University of Colorado**Boulder, Colorado**

Evaluator, "Towards a Center for STEM Education" (NSF DRL 0833364, \$1M), 2008-2012.

Explore the potential for establishing a Center for STEM Education by observing departmental and university cultures and practices that may support or constrain the establishment of a future Center. Assist project management team in articulating and developing its vision for the project. Determine the extent to which stakeholders share the vision and feel value added by the project.

Florida International University**Miami, Florida**

Evaluator, "Center for High Energy Physics Research and Education" (NSF PHY 0802184, \$5M), 2008-2012.

Evaluate physics course transformation, learning assistants, physics education research, and teacher professional development as components of an integrated program of research, cyberinfrastructure, and education and outreach.

Evaluator, "HHMI Faculty Scholars Program," (HHMI, \$800,000), 2010-2015.

Evaluate a program to support course transformation and faculty development through small faculty grants and mentorship.

PUBLICATIONS*Peer-reviewed publications*

1. K. Gray, S. Vokos, M. C. Wittmann, and R. E. Scherr, "Drawings of energy: Evidence of the NGSS model of energy in diagrams," under review for *Phys. Rev. Phys. Educ. Res.* (2018)
2. R. E. Scherr and S. V. Chasteen, "Development and validation of the Physics Teacher Education Program Analysis (PTEPA) Rubric," accepted to 2018 Physics Education Research Conference, edited by A. Traxler, Y. Cao, and S. Wolf (AIP, College Park, MD, 2019)
3. L. M. Goodhew, A. D. Robertson, P. R. L. Heron, and R. E. Scherr, "Examining the productiveness of students' conceptual resources over the course of a problem-solving interview," accepted to 2018 Physics Education Research Conference, edited by A. Traxler, Y. Cao, and S. Wolf (AIP, College Park, MD, 2019)
4. L. Conlin and R. E. Scherr, "Making space to sensemake: Epistemic distancing in small group physics discussions," *Cog. and Instr.* (2018) *online early access*
5. A. R. Daane, J. Haglund, A. D. Robertson, H. G. Close, and R. E. Scherr, "The pedagogical value of conceptual metaphor for secondary science teachers," *Sci. Educ.* 102(5), 1051-1076 (2018)
6. S. V. Chasteen, R. E. Scherr and M. Plisch, "A study of thriving physics teacher education programs: Development of the Physics Teacher Education Program Analysis (PTEPA) Rubric" (American Physical Society, College Park, MD, 2018)
7. A. D. Robertson, S. B. McKagan, and R. E. Scherr, "Selection, generalization, and theories of cause in case-oriented physics education research: Connecting paradigms and practices," *Reviews in PER* 2(5), 1-46 (2018).
8. L. M. Goodhew, A. D. Robertson, P. R. L. Heron, and R. E. Scherr, "Student conceptual resources for understanding wave propagation," 2017 Physics Education Research Conference, edited by L. Ding, A. Traxler, and Y. Cao, 148-151 (AIP, College Park, MD, 2018)
9. A. D. Robertson, L. M. Goodhew, R. E. Scherr, and P. R. L. Heron, "University student conceptual resources for understanding forces," 2017 Physics Education Research Conference, edited by L. Ding, A. Traxler, and Y. Cao, 332-335 (AIP, College Park, MD, 2018)
10. R. E. Scherr and R. M. Goertzen, "Periscope: Looking into learning in best-practices physics classrooms," *The Physics Teacher* 56, 100-103 (2018)
11. R. E. Scherr, M. Plisch, K. Gray, G. Potvin, and T. Hodapp, "Fixed and growth mindsets in physics graduate admissions," *Phys. Rev. Phys. Educ. Res.* 13 020133 1-12 (2017) * *Editor's Suggestion*
12. R. E. Scherr and A. D. Robertson, "Unveiling privilege to broaden participation in physics," *Phys. Teach.* 55 394-397 (2017)
13. R. E. Scherr, M. Plisch, and R. M. Goertzen, "Sustaining PhysTEC programs in physics teacher education," *Phys. Rev. Phys. Educ. Res.* 13 010111 1-16 (2017)
14. A. D. Robertson, R. E. Scherr, L. M. Goodhew, A. R. Daane, K. Gray, and L. B. Aker, "Identifying content knowledge for teaching energy: Examples from high school physics," *Phys. Rev. Phys. Educ. Res.* 13 010105 1-14 (2017)

15. K. Gray and R. E. Scherr, "Drawing energy: Evidence of Next Generation Science Standards for energy in diagrams," 2016 Physics Education Research Conference, edited by A. D. Churukian, D. Jones, and L. Ding, 128-131 (AIP, College Park, MD, 2016)
16. R. E. Scherr and P. R. L. Heron, "Education metaphors we live by," 2016 Physics Education Research Conference, edited by A. D. Churukian, D. Jones, and L. Ding, 316-319 (AIP, College Park, MD, 2016)
17. L. Tucker, R. E. Scherr, T. Zickler, and E. Mazur, "Exclusively visual analysis of classroom group interactions," *Phys. Rev. Phys. Educ. Res.* 12, 020142 1-9 (2016)
18. R. E. Scherr, M. Plisch, and R. M. Goertzen, "Physics teacher production: Patterns of institutional engagement and faculty theories," 2015 Physics Education Research Conference, edited by A. D. Churukian, D. Jones, and L. Ding, 303-306 (AIP, College Park, MD, 2015)
19. R. E. Scherr, B. W. Harrer, A. R. Daane, H. G. Close, A. R. Robertson, L. Seeley, and S. Vokos, "Energy Tracking Diagrams," *Phys. Teach.* 54, 96-102 (2015)
20. R. E. Scherr and R. M. Goertzen, "Periscope: Supporting novice university physics instructors in looking into learning in best-practices physics classrooms," in *Effective Practices in Preservice Physics Teacher Education: Recruitment, Retention, and Preparation*, E. Brewe and C. Sandifer (Eds.), Washington DC: American Institute of Physics (2015)
21. R. E. Scherr and A. D. Robertson, "Productivity of 'collisions generate heat' for reconciling an energy model with mechanistic reasoning: A case study," *Phys. Rev. – Spec. Topics: Phys. Educ. Res.* 11, 010111 1-16 (2015)
22. A. R. Daane, S. B. McKagan, S. Vokos, and R. E. Scherr, "Energy conservation in dissipative processes: Teacher expectations and strategies associated with imperceptible thermal energy," *Phys. Rev. – Spec. Topics: Phys. Educ. Res.* 11, 010109 1-15 (2015)
23. H. G. Close and R. E. Scherr, "Leveraging conceptual metaphor for instruction: Learning activities embodying the substance metaphor for energy," *Int. J. Sci. Educ.* 37(5-6), (2015)
24. R. E. Scherr, M. Plisch, and R. M. Goertzen, "Sustaining programs in physics teacher education: A study of PhysTEC supported sites" (American Physical Society, College Park, MD 2014)
25. A. R. Daane, S. Vokos, and R. E. Scherr, "Goals for teacher learning about energy degradation and usefulness," *Phys. Rev. – Spec. Topics: Phys. Educ. Res.* 10, 020111 1-16 (2014)
26. A. R. Daane, L. Wells, and R. E. Scherr, "Energy Theater," *The Physics Teacher* 52, 291-294 (2014)
27. R. E. Scherr, H. G. Close, E. W. Close, V. J. Flood, S. B. McKagan, A. D. Robertson, L. Seeley, M. C. Wittmann, and S. Vokos, "Negotiating energy dynamics through embodied action in a materially structured environment," *Phys. Rev. – Spec. Topics: Phys. Educ. Res.* 9, 020105 1-18 (2013) * *Editor's Suggestion*
28. C. Alvarado, A. R. Daane, R. E. Scherr, & G. Zavala (2013). "Responsiveness among peers leads to productive disciplinary engagement," in 2013 Physics Education Research Conference, edited by P. V. Englehardt, A. D. Churukian, and D. L. Jones (AIP, Portland, OR, 2013)
29. R. E. Scherr, A. D. Robertson, L. Seeley, and S. Vokos, "Content knowledge for teaching energy: An example from middle-school physical science," C. Singh, M. Sabella, and Englehardt (Eds.), *AIP Conf. Proc.* 1513, 114-117 (2013 Physics Education Research Conference)
30. A. R. Daane, S. Vokos, and R. E. Scherr, "Learner Understanding of Energy Degradation," in 2013 Physics Education Research Conference, edited by P.V. Englehardt, A.D. Churukian, and D L. Jones. (AIP, Portland, OR 2013)
31. R. E. Scherr, H. G. Close, S. B. McKagan, and S. Vokos, "Representing energy. I. Representing a substance ontology for energy," *Phys. Rev. – Spec. Topics: Phys. Educ. Res.* 8(2), 020114 1-11 (2012)
32. R. E. Scherr, H. G. Close, E. W. Close, and S. Vokos, "Representing energy. II. Energy tracking representations," *Phys. Rev. – Spec. Topics: Phys. Educ. Res.* 8(2), 020115 1-11 (2012)

33. B. W. Frank and R. E. Scherr, "Interactional processes for stabilizing conceptual coherences in physics," *Phys. Rev. – Spec. Topics: Phys. Educ. Res.* 8(2), 020101 1-9 (2012)
34. A. R. Daane, S. Vokos, and R.E. Scherr, "Conserving energy in physics and society: Creating an integrated model of energy and the second law of thermodynamics," *AIP Conf. Proc.* 1513, 114-117 (2012 Physics Education Research Conference)
35. R. E. Scherr, H. G. Close, and S. B. McKagan, "Intuitive ontologies for energy in physics," C. Singh, M. Sabella, and Englehardt (Eds.), *AIP Conf. Proc.* 1413, 343-346 (2011 Physics Education Research Conference) – Finalist for 2011 PERC Paper Award
36. H. G. Close and R. E. Scherr, "Differentiation of energy concepts through speech and gesture in interaction," C. Singh, M. Sabella, and Englehardt (Eds.), *AIP Conf. Proc.* 1413, 151-154 (2011 Physics Education Research Conference)
37. B. W. Harrer, R. E. Scherr, M. C. Wittmann, H. G. Close, and B. W. Frank, "Elements of formative assessment in learners' discourse about energy," C. Singh, M. Sabella, and Englehardt (Eds.), *AIP Conf. Proc.* 1413, 203-206 (2011 Physics Education Research Conference)
38. S. B. McKagan, R. E. Scherr, E. W. Close, and H. G. Close, "Criteria for creating and categorizing forms of energy," C. Singh, M. Sabella, and Englehardt (Eds.), *AIP Conf. Proc.* 1413, 279-282 (2011 Physics Education Research Conference)
39. R. E. Scherr, H. G. Close, and S. B. McKagan, "Promoting proximal formative assessment with relational discourse," C. Singh, M. Sabella, and Englehardt (Eds.), *AIP Conf. Proc.* 1413, 347-350 (2011 Physics Education Research Conference)
40. E. W. Close, R. E. Scherr, H. G. Close, and S. B. McKagan, "Development of proximal formative assessment skills in video-based teacher professional development," C. Singh, M. Sabella, and Englehardt (Eds.), *AIP Conf. Proc.* 1413, 19-22 (2011 Physics Education Research Conference)
41. R. E. Scherr, H. G. Close, S. B. McKagan, and E. W. Close, "'Energy Theater': Using the body symbolically to understand energy," C. Singh, M. Sabella, and S. Rebello (Eds.), *AIP Conf. Proc.* 1289, 293-296 (2010 Physics Education Research Conference)
42. E. C. Kahle, R. E. Scherr, and H. G. Close, "An evolving model for seeing colored objects; A case study progression," C. Singh, M. Sabella, and S. Rebello (Eds.), *AIP Conf. Proc.* 1289, 185-188 (2010 Physics Education Research Conference)
43. H. G. Close, L. S. DeWater, E. W. Close, R. E. Scherr, and S. B. McKagan, "Using the Algebra Project method to regiment discourse in an energy course for teachers," C. Singh, M. Sabella, and S. Rebello (Eds.), *AIP Conf. Proc.* 1289, 9-12 (2010 Physics Education Research Conference)
44. E. W. Close, H. G. Close, S. B. McKagan, and R. E. Scherr, "Energy in action: The construction of ideas in multiple modes," C. Singh, M. Sabella, and S. Rebello (Eds.), *AIP Conf. Proc.* 1289, 105-108 (2010 Physics Education Research Conference)
45. R. E. Scherr and H. G. Close, "Transformative professional development: Cultivating concern with others' thinking as the root of teacher identity," *Proceedings of the International Conference of the Learning Sciences* (2010)
46. R. M. Goertzen, R. E. Scherr, and A. Elby, "Respecting TAs' beliefs and experiences: A case study of a physics teaching assistant," *Phys. Rev. – Spec. Topics: Phys. Educ. Res.* 6(020125), 1-11 (2010)
47. R. M. Goertzen, R. E. Scherr, and A. Elby, "Tutorial TAs in the classroom: Similar teaching behaviors are supported by varied beliefs about teaching and learning," *Phys. Rev. – Spec. Topics: Phys. Educ. Res.* 6(010105), 1-15 (2010)
48. R. M. Goertzen, R. E. Scherr, and A. Elby, "Accounting for tutorial teaching assistants' buy-in to reform instruction," *Phys. Rev. – Spec. Topics: Phys. Educ. Res.* 5(020109), 1-20 (2009)
49. R. E. Scherr, "Video analysis for insight and coding: Examples from tutorials in introductory physics," *Phys. Rev. – Spec. Topics: Phys. Educ. Res.* 5(020106), 1-10 (2009)

50. R. E. Scherr and D. Hammer, "Student behavior and epistemological framing: Examples from collaborative active-learning activities in physics," *Cog. & Instr.* 27(2), 147–174 (2009)
 51. D. Hammer, R. S. Russ, R. E. Scherr, and J. Mikeska, "Identifying inquiry and conceptualizing students' abilities," in R.A. Duschl and R.E. Grandy (Eds.), *Teaching scientific inquiry: Recommendations for research and application* (Sense Publishers, Rotterdam, NL), 138-156 (2008)
 52. R. M. Goertzen, R. E. Scherr, and A. Elby, "Indicators of understanding: What TAs listen for in student responses," in C. Henderson, M. Sabella, and L. Hsu (Eds.), *AIP Conf. Proc.* 1064, 119-122 (2008 Physics Education Research Conference)
 53. R. S. Russ, R. E. Scherr, D. Hammer, and J. Mikeska, "Recognizing mechanistic reasoning in scientific inquiry: A framework for discourse analysis developed from philosophy of science," *Sci. Educ.* 92(3), 499-425 (2008)
 54. R. E. Scherr, "Gesture analysis for physics education researchers," *Phys. Rev. – Spec. Topics: Phys. Educ. Res.* 4(010101), 1-9 (2008)
 55. L. D. Conlin, A. Gupta, R. E. Scherr, and D. Hammer, "The dynamics of students' behaviors and reasoning during collaborative physics tutorial sessions," in L. Hsu, C. Henderson, and L. McCullough (Eds.), *AIP Conf. Proc.* 951, 69-72 (2007 Physics Education Research Conference)
 56. R. E. Scherr, "Modeling student thinking: An example from special relativity," *Am. J. Phys.* 70(3), 272-280 (2007)
 57. R. E. Scherr and A. Elby, "Enabling informed adaptation: Open-source physics worksheets integrated with implementation resources," in P. R. L. Heron, L. McCullough, and J. Marx (Eds.), *AIP Conf. Proc.* 883, 46-49 (2006 Physics Education Research Conference)
 58. R. E. Scherr, R. S. Russ, T. J. Bing, and R. A. Hodges, "Initiation of student-TA interactions in tutorials," *Phys. Rev. – Spec. Topics: Phys. Educ. Res.* 2, 020108-020116 (2006)
 59. E. F. Redish, R. E. Scherr, and J. Tuminaro, "Reverse-engineering the solution of a 'simple' physics problem: Why learning physics is harder than it looks," *Phys. Teach.* 44, 293-300 (2006)
 60. R. E. Scherr and E. F. Redish, "Newton's zeroth law: Learning from listening to our students," *Phys. Teach.* 43, 41-45 (2005)
 61. D. Hammer, A. Elby, R. E. Scherr, and E. F. Redish, "Resources, framing, and transfer," in J. P. Mestre (Ed.), *Transfer of learning: Research and perspectives* (IAP, Greenwich, CT) (2005)
 62. R. E. Scherr, "An implementation of Physics by Inquiry in a large-enrollment class," *Phys. Teach.* 41(2), 113-118 (2003)
 63. R. E. Scherr, "Gestures as evidence of student thinking in physics," in J. Marx, K. Cummings, and S. Franklin (Eds.), *AIP Conf. Proc.* 720, 61-64 (2003 Physics Education Research Conference)
 64. M. C. Wittmann and R. E. Scherr, "Student epistemological stance constraining researcher access to student thinking: An example from an interview on charge flow," in S. Franklin, K. Cummings, and J. Marx (Eds.), *Physics Education Research Conference Proceedings 2002*
 65. R. E. Scherr, P. S. Shaffer, and S. Vokos, "The challenge of changing deeply-held student beliefs about the relativity of simultaneity," *Am. J. Phys.* 70(12), 1238-1248 (2002)
 66. R. E. Scherr and M. C. Wittmann, "The challenge of listening: The effect of researcher agenda on data collection and interpretation," in S. Franklin, K. Cummings, and J. Marx (Eds.), *Physics Education Research Conference Proceedings 2002*
 67. R. E. Scherr, P. S. Shaffer, and S. Vokos, "Student understanding of time in special relativity: Simultaneity and reference frames," *Phys. Educ. Res., Am. J. Phys. Suppl.* 69, S24-S35 (2001)
- Instructional resources*
68. R. E. Scherr and R. M. Goertzen, *Periscope: Looking into learning in best practices university physics classrooms*. www.physport.org/periscope, released 2015
 69. A. Elby, R. E. Scherr, T. McCaskey, R. Hodges, E. F. Redish, D. Hammer, & T. Bing, *Maryland Open Source Tutorials in Physics Sensemaking: Suite I* (2007). R. E. Scherr, A. Elby, R. M.

Goertzen, & L. D. Conlin, Open Source Tutorials in Physics Sensemaking: Suite II (2010).

www.spu.edu/depts/physics/tcp/tadevelopment.asp

70. Contributions to Physics by Inquiry, L. C. McDermott and the Physics Education Group at the University of Washington (John Wiley and Sons, Inc., New York, 1996)
71. Contributions to Tutorials in Introductory Physics, L. C. McDermott, P. S. Shaffer, and the Physics Education Group at the University of Washington (Prentice-Hall, Upper Saddle River, NJ, 1998)

Books and other publications

72. R. E. Scherr, "Physics faculty mindsets in graduate admissions," APS Forum on Education Newsletter (Fall 2018)
73. A. D. Robertson, R. E. Scherr, and D. Hammer, Eds., "Responsive Teaching in Science," Routledge Press (2015)
74. R. E. Scherr, M. Plisch, and R. M. Goertzen, "Sustaining programs in physics teacher education: A study of PhysTEC supported sites" (American Physical Society, College Park, MD, 2014)
75. R. E. Scherr, "What keeps girls from studying physics and STEM," opinion piece for The Seattle Times (September 14, 2014)
76. R. E. Scherr, "Tackling energy head on," Physics World (August 2014)
77. R. E. Scherr and R. M. Goertzen, "Periscope: Looking into learning in best-practices physics classrooms," APS Forum on Education Newsletter (Spring 2014)
78. M. C. Wittmann, P. R. L. Heron, and R. E. Scherr, "Overview of the Foundations and Frontiers in Physics Education Research Conference," APS Forum on Education Newsletter (Fall 2005)

SELECTED PRESENTATIONS

- Gordon Research Seminar, June 2018.** **Smithfield, Rhode Island**
(Keynote) "Approaches to energy instruction and education research," R. E. Scherr.
- APS Northwest Section Annual Meeting, June 2018.** **Tacoma, Washington**
- Pacific Northwest Assoc. for College Physics Annual Meeting, April 2018.** **Bothell, Washington**
(Invited) "Physics faculty mindsets in graduate admissions," R. E. Scherr, M. Plisch, K. E. Gray, G. Potvin, and T. Hodapp.
- APS National Meeting, April 2018.** **Columbus, Ohio**
(Invited) "Fixed and growth mindsets in graduate admissions," R. E. Scherr, M. Plisch, K. E. Gray, G. Potvin, and T. Hodapp.
- AAPT Summer National Meeting, July 2017.** **Cincinnati, Ohio**
(Invited) "Fixed and growth mindsets in graduate admissions," R. E. Scherr, M. Plisch, K. E. Gray, G. Potvin, and T. Hodapp.
(Invited) "Physics faculty knowledge and beliefs about equity and inclusion," R. E. Scherr, A. D. Robertson, W. T. Hairston, S. B. McKagan, and A. R. Daane.
- Foundations and Frontiers of Physics Education Research, June 2017.** **Bar Harbor, Maine**
(Contributed poster) "Fixed and growth mindsets in graduate admissions," R. E. Scherr, M. Plisch, K. E. Gray, G. Potvin, and T. Hodapp.
- Gordon Research Conference, June 2016.** **Newport, Rhode Island**
(Invited) "Special relativity: Learners' ideas about time and space, and researchers' ideas about learning," R. E. Scherr.
- AAPT Summer National Meeting, July 2015.** **College Park, Maryland**
(Contributed) "Periscope: Looking into learning in best-practices physics classrooms," R. E. Scherr and R. M. Goertzen.

- PhysTEC Conference, February 2015.** **Seattle, Washington**
- AAPT Summer National Meeting, July 2014.** **Minneapolis, Minnesota**
- AAPT Winter National Meeting, January 2014.** **Orlando, Florida**
- APS National Meeting, April 2014.** **Savannah, Georgia**
(Invited) "Sustaining programs in physics teacher education," R. E. Scherr, M. Plisch, and R. M. Goertzen.
- European Science Education Research Association, September 2013.** **Nicosia, Cyprus**
(Invited) "Understanding energy with a social embodied learning activity," R. E. Scherr, H. G. Close, A. R. Daane, and S. Vokos.
- AAPT Winter National Meeting, January 2013.** **New Orleans, Louisiana**
(Invited) "Piagetian and ethnographic influences in physics education research," R. E. Scherr.
- Foundations and Frontiers of PER – Puget Sound, June 2012.** **Diablo, Washington**
(Invited) "One physics education researcher's foundations and frontiers: Piaget and ethnography," R. E. Scherr.
- APS March Meeting, April 2012.** **Atlanta, Georgia**
(Contributed) "Preparing learning assistants for university instruction and beyond," R. E. Scherr.
- AAPT Winter National Meeting, February 2012.** **Ontario, California**
(Contributed) "Representing energy transfers and transformations," R. E. Scherr, H. G. Close, L. Seeley, and S. B. McKagan.
(Contributed) "Learners' understanding of energy: Conservation of amount, decrease of value," A. R. Daane, L. Seeley, A. D. Robertson, S. Vokos, and R. E. Scherr.
(Contributed) "A conceptual blending theory analysis of Energy Theater," H. G. Close, E. W. Close, R. E. Scherr, and S. B. McKagan.
- AAPT Summer National Meeting, August 2011.** **Omaha, Nebraska**
(Contributed) "Intuitive ontologies for energy in physics," R. E. Scherr, S. B. McKagan, and H. G. Close.
(Contributed) "Elements of formative assessment in learners' discourse about energy," B. W. Harrer, R. E. Scherr, M. C. Wittmann, H. G. Close, and B. W. Frank.
- Foundations and Frontiers of Physics Education Research, June 2011.** **Bar Harbor, Maine**
(Plenary) "Student-centered learning, teacher-centered professional development, and scholar-centered research," R. E. Scherr, H. G. Close, and S. B. McKagan.
- Congreso de Investigación, Innovación, y Gestión Educativas, May 2011.** **Monterrey, Mexico**
(Plenary) "Student behavior and epistemological framing: Examples from collaborative active-learning activities in physics," R. E. Scherr.
- Oregon State University Department of Physics, October 2010.** **Corvallis, Oregon**
(Colloquium) "Using the body symbolically to understand physics," R. E. Scherr, H. G. Close, E. W. Close, and S. B. McKagan.
- AAPT Summer National Meeting, July 2010.** **Portland, Oregon**
(Invited) "Thinking about energy with bodies and objects: Cognition as a sensorimotor and material activity," R. E. Scherr, H. G. Close, and S. B. McKagan.
(Invited) "Cultivating concern with others' thinking as the root of teacher identity," H. G. Close and R. E. Scherr.
(Invited) "A new perspective on teaching assistants: Respecting TAs' beliefs and experiences," R. M. Goertzen, R. E. Scherr, and A. Elby.
- International Conference of the Learning Sciences, June 2010.** **Chicago, Illinois**
(Contributed) "Thinking about energy with bodies and objects: Cognition as a sensorimotor and material activity," H. G. Close and R. E. Scherr.

(Contributed) "Cultivating concern with others' thinking as the root of teacher identity,"
H. G. Close and R. E. Scherr.

C. Wieman Science Educ. Initiative, Univ of British Columbia, November 2009. Vancouver, BC
(Colloquium) "Building partnerships between tutorial reformers and teaching assistants,"
R. E. Scherr, R. M. Goertzen, and A. Elby.

University of Colorado Physics Education Research Group, August 2009. Boulder, Colorado
(Seminar) "Enriching the intellectual life of teachers," H. G. Close and R. E. Scherr.

Foundations and Frontiers of Physics Education Research, June 2009. Bar Harbor, Maine
(Invited) "Qualitative analysis of video-recorded interaction," R. E. Scherr.

AERA Annual Meeting, April 2009. San Diego, California
(Contributed) "Novice teachers of university classes: Understanding physics graduate teaching
assistants," R. E. Scherr, R. M. Goertzen, A. Elby, and D. Hammer.

AAPT Winter National Meeting, February 2009. Chicago, Illinois
(Invited) "Preparing perceptive teachers, K-20," R. E. Scherr, R. M. Goertzen, A. Elby, and
D. Hammer.

University of Colorado Physics Education Research Group, January 2009. Boulder, Colorado
(Seminar) "Informal science talk in tutorials: Challenges for research and instructional design,"
R. E. Scherr.

International Conference of the Learning Sciences, June 2008. Utrecht, The Netherlands
(Contributed) "Student behavior and epistemological framing: Examples from collaborative
active-learning activities in physics," R. E. Scherr and D. Hammer.

AAPT Winter National Meeting, January 2008. Baltimore, Maryland
(Invited) "Student behavior and epistemological framing: Examples from tutorials," R. E. Scherr
and D. Hammer.
(Invited) "Integrating mathematical and physical reasoning: The role of mechanistic
explanation," B. W. Frank, R. E. Scherr, and D. Hammer.

New Jersey AAPT Section Meeting, March 2007. Princeton, New Jersey
(Invited) "Recognizing valuable student thinking in physics," R. E. Scherr, D. Hammer, A. Elby,
and E. F. Redish.

Gordon Conference on Physics Research and Education, June 2006. S. Hadley, Massachusetts
(Plenary) "Student resources for problem-solving in electricity and magnetism: Implications of a
model of learning," R. E. Scherr.

NARST Annual Meeting, April 2006. San Francisco, California
(Contributed) "How do students frame collaborative active learning activities?" R. E. Scherr.

AAPT Summer National Meeting, August 2005. Sacramento, California
(Invited) "Resources, framing, and transfer," D. Hammer, A. Elby, R. E. Scherr, and
E. F. Redish.

AAPT Winter National Meeting, January 2005. Syracuse, New York
(Invited) "Einsteinian thinking among ordinary students: Examples from special relativity,"
R. E. Scherr.

Gordon Conference on Physics Research and Education, June 2004. S. Hadley, Massachusetts
(Plenary) "Properties of student reasoning in special relativity," R. E. Scherr and S. Vokos.

International School of Physics "Enrico Fermi," July 2003. Varenna, Italy
(Invited) "Gestures as evidence of student thinking in physics," R. E. Scherr.

AAPT Winter National Meeting, January 2003. Austin, Texas
(Invited) "Questioning the questions: Playing with constraints in physics education research,"
R. E. Scherr.

(Invited) “The challenge of listening: Selective attention in clinical interviews,” R. E. Scherr and M. C. Wittmann.

Department of Physics, University of Maine, May 2002. **Orono, Maine**
(Colloquium) “Modeling student reasoning in physics: An example from special relativity,” R. E. Scherr.

AAPT Winter National Meeting, January 2002. **Philadelphia, Pennsylvania**
(Invited) “Coordinating theoretical models of student reasoning with evidence: An example from special relativity,” R. E. Scherr.

AAPT Summer National Meeting, August 2001. **Rochester, New York**
(Invited) “An implementation of *Physics by Inquiry* in a large-enrollment class,” R. E. Scherr.

PROFESSIONAL SERVICE AND DEVELOPMENT

Foundations and Frontiers of Physics Education Research, 2005-present. **Bar Harbor, Maine**
Co-founder and co-organizer (with P.R.L. Heron and M.C. Wittmann)

Design and plan a conference for specialists who are active researchers in the field of physics education. The week-long residential intensive meeting is the premier forum for examining and articulating the current state of the field and identifying promising avenues for future research.

APS Education Policy Committee, 2017-present. **Various locations**
Member, 2017-2018.

Physical Review Special Topics – Physics Education Research, 2014-present. **Various locations**
Editorial board member, 2015-2018; Guest editor, Focused Collection on Preparing and Supporting University Physics Educators, 2016

APS Group in Physics Education Research, 2013-2017. **Various locations**
Organizing committee, 2013; Vice Chair, 2014; Chair-Elect, 2015; Chair, 2016; Past Chair, 2017

AAPT Physics Education Research Leadership Organizing Council, 2006-2011. **Various locations**
Chair, 2009-2011; Member, 2007-2011; Member ex officio, 2006-2007 (as RiPE chair)

The Physics Teacher, 2007-2009. **Various locations**
Member, Editorial Board

AAPT Research in Physics Education (RiPE) Committee, 2004-2007. **Various locations**
Chair, 2006-2007; Member, 2004-2007

Physics Education Research Conference, 2003-2004. **Various locations**
Co-organizer (with S. Rebello and M.C. Wittmann), 2004; Organizer (with M.C. Wittmann), 2003

Design and plan two-day conference adjoining the Summer National Meeting of the American Association of Physics Teachers, the main annual meeting for physics education researchers.

NSF Summer Institute for Teachers of CIPS, August 2002. **San Diego, California**
Participate in a course to prepare middle school teachers to teach physics and physical science using the *Constructing Ideas in Physical Science* curriculum.

Optometry Admissions Test Construction Committee, 2002-2006. **Chicago, Illinois**
Construct and test items for national standardized physics examination.

AWARDS AND FELLOWSHIPS

Fellow of the American Physical Society

Topical Group in Physics Education Research, 2017.

Cited “for foundational research into energy learning and representations, application of video analysis methods to study physics classrooms, and physics education research community leadership.”

University of Washington**Seattle, Washington***National Science Foundation Graduate Fellow, 1994-1997.**American Association of Physics Teachers Outstanding Teaching Assistant, 1995.***Reed College****Portland, Oregon***Thomas J. Watson Fellow, 1993-1994.*

Engaged in a year of independent study and travel abroad following graduation. Directed the construction and presentation of science exhibits at an international school in Botswana.

Investigated science museums and other informal science education in south and southeast Asia.

DOCTORAL STUDENTS

Abigail R. Daane, PhD, Seattle Pacific University School of Education, 2015; currently faculty at South Seattle College, Seattle, WA.

Benedikt W. Harrer, PhD, University of Maine Department of Physics, 2013; currently Assistant Professor of Physics, San José State University, CA.

Renee Michelle Goertzen, PhD, University of Maryland Department of Physics, 2010. Currently Education Programs Manager, Department of Education and Diversity, American Physical Society, College Park, MD.

Brian W. Frank, PhD, University of Maryland Department of Physics, 2009. Currently Assistant Professor of Physics, Middle Tennessee State University, Murfreesboro, TN.

Rosemary S. Russ, PhD, University of Maryland Department of Physics, 2006. Currently Assistant Professor of Science Education, Department of Curriculum and Instruction, University of Wisconsin, Madison, WI.

REFERENCES

Dr. Ted Hodapp, Director of Special Programs
 Dr. Monica Plisch, Director of Education & Diversity
 American Physical Society
 One Physics Ellipse, College Park, MD 20740
 (301) 209-3273; plisch@aps.org

Prof. E. F. (Joe) Redish
 Department of Physics
 Univ. of Maryland, College Park, MD 20742
 (301) 405-6120; redish@umd.edu

Prof. Paula R. L. Heron
 Department of Physics
 University of Washington, Seattle, WA 98119
 (206) 543-3894; pheron@uw.edu

Prof. Stamatis Vokos
 Department of Physics
 Cal Poly San Luis Obispo
 San Luis Obispo, CA 93407
 (805) 756-2306; svokos@calpoly.edu

Prof. Michael C. Wittmann
 Department of Physics
 University of Maine, Orono, ME 04469
 (207) 581-1015; mwittmann@maine.edu