

STACEY LOWERY BRETZ

Miami University • Department of Chemistry & Biochemistry • 651 E. High St. • 369 Hughes Lab • Oxford, OH 45056
513-529-3731 • bretzsl@MiamiOH.edu • http://MiamiOH.edu/bretzsl • @SLBCER

PROFESSIONAL EXPERIENCE

- **University Distinguished Professor**, Miami University, Department of Chemistry & Biochemistry, 2015 – present
- **Volwiler Distinguished Research Professor**, Miami University, Department of Chemistry & Biochemistry, 2012–2015
- **Professor of Chemistry**, Miami University, Department of Chemistry & Biochemistry, 2005–present
- **Professor of Chemistry**, Youngstown State University, Department of Chemistry, 2004–2005
- **Associate Professor of Chemistry**, Youngstown State University, Department of Chemistry, 2000–2004
- **Assistant Professor of Chemistry**, University of Michigan-Dearborn, Department of Natural Sciences, 1995–2000
- **Director of Evaluation, Assessment, & Pedagogy**, ModularChem Consortium, University of California, Berkeley, 1994–1995. Mentored faculty across 16 institution consortium to create innovative pedagogy and assessments for modular undergraduate chemistry curriculum. Designed and implemented evaluation strategies.

EDUCATION

Postdoctoral Research Associate, Chemistry Education Research Advisor: Dr. Angelica Stacy
University of California, Berkeley; Berkeley, CA; Department of Chemistry, 1994–1995
Developed module-based introductory chemistry course targeting nonscience majors. Investigated utility of assimilation theory and cognitive learning tools as assessment measures therein.

Doctor of Philosophy, Chemistry Education Research Advisor: Dr. Joseph Novak
Cornell University, Ithaca, NY; Departments of Chemistry & Education, 1994
Committee Members: Dr. Roald Hoffmann, Dr. Jerrold Meinwald, Dr. Joän Egner.
Dissertation: Learning Strategies and Their Influence Upon Students' Conceptions of Science Literacy and Meaningful Learning: The Case of a College Chemistry Course for Nonscience Majors.
Minors: Curriculum & Instruction, Adult Education, Program Planning & Evaluation

Master of Science, Chemistry Advisor: Dr. Ayusman Sen
Pennsylvania State University, University Park, PA; Department of Chemistry, 1991
Committee Members: Dr. Andrew Ewing, Dr. Patricia Bianconi.
Thesis: Electrochemistry of substituted poly(ethylenepyrrole).

Bachelor of Arts, Chemistry Advisor: Dr. Héctor Abruña
Cornell University, Ithaca, NY; Department of Chemistry, 1989
Undergraduate research: Molecular weight dependence of electrochemical properties of ruthenium polymer complexes.

HONORS & AWARDS

- Research Paper selected as ACS Editor's Choice: 2014, 2018
- University Distinguished Professor, Miami University, 2015
- Distinguished Scholar, Miami University, 2015
- Chemist of the Year, American Chemical Society Cincinnati Local Section, 2015
- Distinguished Teaching Award for Excellence in Graduate Instruction and Mentoring, Miami University, 2013
- Fellow, American Chemical Society, 2012
- Institute for Miami Leadership Development, 2012-2013
- Fellow, American Association for the Advancement of Science, 2009
- E. Phillips Knox Award for Excellence in Undergraduate Teaching, Miami University, 2009
- Ursa Major Award for Professional Distinction, Alpha Phi International Fraternity, 2008
- Perkins High School Distinguished Alumna of the Year, 2007
- Chair, Gordon Research Conference on Chemistry Education Research & Practice, 2005
- Distinguished Professor of Research, Youngstown State University, 2005
- Vice-Chair, Gordon Conference on Chemistry Education Research & Practice, 2004
- Excellence in Education Award Top 100 Educators in Ohio, *Ohio Magazine*, 2003
- Excellence in Teaching Award, Northeast Ohio Council of Higher Education, 2003
- Distinguished Professor of Teaching, Youngstown State University, 2003
- Chemistry Education Scholar, University of Maine, 2003
- Project Kaleidoscope Keck Consultancy Observer, 1997
- Project Kaleidoscope Faculty for the 21st Century Network, 1996
- Horace H. Rackham Fellow, University of Michigan, 1996

COURSES TAUGHT (at Miami University unless indicated otherwise)*Undergraduate Courses*

- General Chemistry for Chemistry & Biochemistry majors
- General Chemistry for STEM (non-chemistry) majors
- General Chemistry in a Biological Context (UM-D)
- Chemistry Misconceptions & Conceptual Change
- Learning Theories in Chemistry
- Chemistry in Modern Living (YSU)
- Chemistry and Society (UM-Dearborn)
- Natural Science Colloquium (UM-D)
- Teaching College Science: An Introduction (UM-D)
- Teaching College Science: Classroom Dynamics (UM-D)

Graduate Courses

- Chemistry Misconceptions & Conceptual Change
- Learning Theories in Chemistry
- Mathematics in Learning Chemistry
- Chemistry Education Research as a Discipline
- Best Practices in Concept Inventory Design
- Who's Who in Chemistry Education Research
- Undergraduate Chemistry Laboratory
- Visualization & Chemistry Representations
- An Introduction to Teaching Chemistry (YSU)
- Chemistry & National Science Education Standards (YSU)
- Inquiry Matters: Teaching Physical Science through Inquiry (YSU)
- Methods of Chemistry Education Research (YSU)
- The Teaching and Learning of Chemistry (YSU)

TEXTBOOKS

- *CHEMISTRY: The Science in Context* (5th edition), by Thomas Gilbert, Rein Kirss, Natalie Foster, **Stacey Lowery Bretz**, and Geoff Davies; W.W. Norton Publishers, © 2017
- *CHEMISTRY: An Atoms-Focused Approach* (2nd edition), by Thomas Gilbert, Rein Kirss, Natalie Foster, and **Stacey Lowery Bretz**; W.W. Norton Publishers, © 2017

Research from the Bretz group has been incorporated into the pedagogy of both of these General Chemistry textbooks. Each chapter begins with Particulate Review and Particulate Preview questions. The Review is a diagnostic tool that asks students to reflect upon their prior knowledge by interpreting molecular artwork. The Preview scaffolds the learning that is to come by asking students to look at new molecular artwork and extend their prior knowledge by making predictions about new concepts to be learned. A Visual Problem Matrix has been added to the collection of visualization problems at the end of every chapter. The matrix consists of macroscopic, particulate, and symbolic representations, followed by a collection of six questions that require students to identify commonalities and differences across the representations. This pedagogy has been extended through the creation of 400+ questions in Smartwork, the online homework system.

POSTDOCTORAL SCHOLARS MENTORED AT MIAMI UNIVERSITY

5. Dr. Molly Atkinson (2019 – 2020)
4. Dr. Gregory Allen (*current position: Assistant Professor of Chemistry, Mendocino College*)
3. Dr. Mary Beth Anzovino (*current position: Assistant Professor of Chemistry, Georgia Gwinnett College*)
2. Dr. LaKeisha McClary (*current position: Assistant Professor of Chemistry, George Washington University*)
1. Dr. David Sanabria-Ríos, Heanon Wilkins Fellow (*current position: Associate Professor of Chemistry, InterAmerican University*)

DOCTORAL STUDENT DISSERTATIONS

14. Sarah Fullington, "Investigating Students' Mindset in the Chemistry Laboratory: The Role of Ability and Effort," Miami University, expected May 2021
13. Jason Marko, "Students' Understandings of Representations of Colligative Properties," Miami University, expected May 2021
12. Zahilyn Roche Allred, "General Chemistry and Physical Chemistry Students' Understandings of Energy Quantization and Probability Representations of the Electronic Structure of the Atom," Miami University, degree expected May 2019 (*future position: Postdoctoral Scholar, Florida International University*)
11. Timothy Abell, "General Chemistry and Physical Chemistry Students' Understandings of Enthalpy and Entropy Changes in the Contexts of Dissolving and Precipitation," Miami University, degree expected May 2019 (*future position: Postdoctoral Scholar, University of Massachusetts, Boston*)
10. Maia Popova, "Organic Chemistry Students' Understandings of Stability and Reactivity: Challenges with Interpreting Concepts Encoded in Structural Formulas, Reactions, and Reaction Coordinate Diagrams," Miami University, May 2018 (*current position: Postdoctoral Scholar, University of Nebraska*)
9. Kelli Rush Galloway, "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory," Miami University, December 2015 (*current position: Postdoctoral Scholar, University of Ottawa*)

DOCTORAL STUDENT DISSERTATIONS

8. Alexandra R. Brandriet, "Investigating Students' Understandings of the Symbolic, Macroscopic, and Particulate Domains of Oxidation-Reduction and the Development of the Redox Concept Inventory," Miami University, August 2014 (*current position: Lecturer, Auburn University*)
7. Michael P. Bindis, "Students' Misconceptions about Intermolecular Forces as Investigated through Paper Chromatography Experiments and the Molecular Attractions Concept Inventory," Miami University, December 2013 (*current position: Assistant Professor of Education, College of Mount St. Joseph*)
6. Cynthia J. Luxford, "Use of Multiple Representations to Explore Students' Understandings of Covalent and Ionic Bonding as Measured by the Bonding Representations Inventory," Miami University, May 2013 (*current position: Assistant Professor of Chemistry, Texas State University*)
5. Jana D. Jensen Olwine, "Students' Understandings of Acid-Base Reactions Investigated through their Classification Schemes and the Acid-Base Reactions Concept Inventory," Miami University, May 2013 (*current position: Visiting Assistant Professor of Chemistry, Bethel College*)
4. Ana Vasquez Murata Mayo, "Atomic Emission Misconceptions as Investigated through Student Interviews and Measured by the Flame Test Concept Inventory," Miami University, May 2013 (*current position: Lecturer, Chaffee College*)
3. Kimberly Linenberger Cortes, "Biochemistry Students' Understandings of Enzyme-Substrate Interactions as Investigated through Multiple Representations and the Enzyme-Substrate Interactions Concept Inventory," Miami University, December 2011 (*current position: Assistant Professor of Chemistry, Kennesaw State University*)
2. Mary Elizabeth Emenike, "What is a Chemical? Fourth-Grade Children's Categorization of Everyday Objects and Substances," Miami University, August 2010 (*current position: Assistant Professor of Chemistry, Rutgers University*)
1. Nathaniel Grove, "A Change in Structure: Meaningful Learning and Cognitive Development in a Spiral Organic Chemistry Curriculum," Miami University, May 2008. (*current position: Associate Professor of Chemistry, University of North Carolina Wilmington*)

MASTER'S STUDENT THESES

6. Michael Croisant, "Investigating Students' Conceptions of Chemical Kinetics and Reaction Coordinate Diagrams," Miami University, expected May 2019
5. Kathryn Nafziger, "Particulate Nature of Matter, Self-Efficacy, and Pedagogical Content Knowledge: Case Studies in Inquiry," Miami University, August 2008. (*current position: Chemistry Teacher, Indian Hills High School, OH*)
4. Michael Fay, "Exploring the Undergraduate Chemistry Laboratory Curriculum: Faculty Perspectives," Miami University, Miami University, May 2008. (*current position: Chemistry Teacher, St. Henry High School, KY*)
3. Nathaniel Grove, "CHEMX: Assessing Cognitive Expectations in Learning Chemistry," Youngstown State University, August 2005. (*current position: Associate Professor of Chemistry, University of North Carolina Wilmington*)
2. Christine Lucarielli, "The Influence of Cooperative Learning on the Affective Dimensions of Learning Biology," Youngstown State University, August 2005. (*current position: Biology Teacher, Girard High School, OH*)
1. Les McSparrin, "The Effect of Guided Inquiry upon Student Misconceptions in Chemistry," Youngstown State University, August 2005. (*current position: Chemistry Teacher, Ball State University, Indiana Academy, IN*)

RESEARCH INTERESTS

- Design assessments to measure chemistry students' cognitive and affective learning.
- Investigate students' understandings of symbolic, particulate, and macroscopic chemistry representations.
- Design experiments, rubrics, and assessments for meaningful learning and inquiry learning in the chemistry laboratory.

RESEARCH FUNDING (\$5.26M to date as PI/co-PI)

22. Ward, R.M.; **Bretz, S.L.**; Diekman, A.; Yeziarski, E.J. "IGE: Interdisciplinary STEM Graduate Student Learning Communities," National Science Foundation, Division of Graduate Education, **\$433,997**, September 1, 2018 – August 31, 2021.
21. **Bretz, S.L.** "Measuring Chemistry Students' Understandings of Multiple External Representations through Cluster Analysis," National Science Foundation, IUSE Program, #1432466, **\$1,277,408**, August 15, 2014 – August 14, 2019.
20. **Bretz, S.L.** "Measuring Misconceptions about Multiple Representations," Volwiler Family Endowment, Miami University, **\$160,397**, July 1, 2012 – June 30, 2015
19. Brandriet, A.R.; **Bretz, S.L.** "Student Misconceptions about Redox Reactions," National Science Foundation, Graduate Research Fellowship Program; **\$121,500**; June 1, 2011 - May 31, 2014.

RESEARCH FUNDING (cont'd)

18. **Bretz, S.L.** "Chemistry Education Research Doctoral Fellows Program," National Science Foundation, DRL-DR-K12 Program #0733642; **\$1,312,496**, September 1, 2007 – August 30, 2014.
17. Makaroff, C.; **Bretz, S.L.** (co-PI/evaluator); Sarquis, A.M.; Sarquis, J.L. "Science, Technology, Engineering, and Mathematics Scholarships to Recruit and Retain Undergraduate Chemistry and Biochemistry Majors," National Science Foundation (DUE-SSTEM) #0728614; **\$576,078**, September 1, 2007 - August 30, 2013.
16. Holme, T.A. **Bretz, S.L.**; Towns, M.H.; Stevens, R.; Lewis, J.; Stacy, A.M.; Pienta, N.; Cooper, M.M.; "Collaborative Research: A Model for Data-Driven Reform in Chemistry Education," NSF-DUE-CCLI-Phase 3, **\$524,970**; September 15, 2008 – February 15, 2011.
15. Winslow, J.; Uludag, N.; **Bretz, S.L.** "The Science and Literature Connection Project," Martha Holden Jennings Foundation; **\$3000**; March 1, 2006 – June 30, 2007.
14. **Bretz, S.L.**; Towns, M.H. "Learning in the Chemistry Laboratory: Exploring the Gap between Student and Faculty Goals for Meaningful Learning," National Science Foundation; Course, Curriculum, and Laboratory Improvement (CCLI) #0536776; **\$130,000**; May 1, 2006-April 30, 2009.
13. **Bretz, S.L.** "CHEMX: Assessing Cognitive Expectations for Learning Chemistry." National Science Foundation; Division of Undergraduate Education; Course, Curriculum, Laboratory Improvement – Assessment of Student Achievement (ASA) #0404975/#0626027, **\$113,012**; July 1, 2004 – June 30, 2006.
12. **Bretz, S.L.** "2005 Chemistry Education Research and Practice Gordon Conference." National Science Foundation, Division of Chemistry & Division of Undergraduate Education, Special Programs #0443790; **\$20,000**; October 1, 2004 – September 30, 2005.
11. **Bretz, S.L.**; Lovelace-Cameron, S. "Inquiry Matters – Incorporating Inquiry into Teaching Physical Science," Title II Improving Teacher Quality Program #03-53, Ohio Board of Regents; March 1, 2004 – May 31, 2005; **\$87,936**.
10. **Bretz, S.L.**; Lovelace-Cameron, S. "Inquiry Matters – Incorporating Inquiry into Teaching Physical Science," Title II Improving Teacher Quality Program #02-45, Ohio Board of Regents, April 1, 2003 – May 31, 2004; **\$117,398**.
9. **Bretz, S.L.** "An Innovative Approach to Professional Development for High School Chemistry Teachers: A New Kind of Masters' Degree." U.S. Department of Education, Fund for the Improvement of Post-Secondary Education (FIPSE) #P116B011231, October 1, 2001 - September 30, 2005; **\$332,990**.
8. **Bretz, S.L.** "Collaborative Investigations for Learning Chemistry: Pre-Service Teachers and Learning through Inquiry." Ohio Board of Regents, Summer 2001, **\$9000**.
7. Mincey, D.W.; Hunter, A.D.; Jackson, J.A.; Lovelace-Cameron, S.R.; Wagner, T.R. "Research Experience for Chemistry Undergraduates at Youngstown State University: A Bridge Between Four-Year Colleges and Ph.D. Research Universities." NSF-CHEM-REU #00-107, **\$180,000 (Bretz, S.L., Evaluation Senior Personnel)**.
6. Hunter, A.D.; Hoistad, L.M.; Jireitano, A.J. "RUI-WEB Accessible Single Crystal X-ray Diffraction Facility for a Consortium of Predominantly Undergraduate Institutions." NSF-CHEM-CCLI, April 1, 2001 – March 31, 2004; **\$200,000 (Bretz, S.L., Evaluation Senior Personnel)**.
5. Hunter, A.D. "X-Ray Diffraction Analysis Throughout the Curriculum: A Powerful Tool for Understanding Molecular Structure and Bonding." National Science Foundation, CCLI-EMD (Educational Materials Development) #9980921, May 1, 2000- April 30, 2002; **\$74,707 (Bretz, S.L., Evaluation Senior Personnel)**.
4. Hunter, A.D.; **Bretz, S.L.** "The Ohio Project for Science Teaching." Ohio Board of Regents, July 1, 1999 - December 31, 2003, **\$4000**.
3. **Bretz, S.L.** "Preparing the Future Professoriate: TA Training and Chemistry Pedagogy." Camille and Henry Dreyfus Foundation, Special Grant Program; June 1, 1998 - June 1, 1999; **\$17,500**.
2. **Bretz, S.L.** "Science Literacy through Chemistry: A Cognitive Science Approach to Improving Teaching and Learning." Horace Rackham Grant and Fellowship Program; January 1, 1996 – December 31, 1999; **\$15,500**.
1. Moore, C.B.; Stacy, A.M.; Kegley, S.E.; Bergman, R. G. "Sweeping Change in Manageable Units: A Modular Approach to Chemistry Curriculum Reform." National Science Foundation, Systemic Change Initiative; January 1, 1995 – December 31, 2000; #DUE-9455924; **\$4,750,000. (Bretz, S.L., Evaluation Senior Personnel)**

PUBLICATIONS (undergraduates & high school teachers underlined)

SLB mean publication rate = 6.5 papers/year (72 papers since 2007)

U.S. mean publication rate in CER @ PhD institutions = 1 paper /year (ref: Craig et al, J. Chem. Educ., 2012)

94. Marko, J.A.; Durgham, A.; Bretz, S.L.; Liu, W. "Electrochemical Benzylic Oxidation of C–H Bonds," *Chem. Comm.*, submitted
93. Bretz, S.L. "Evidence for the Importance of Laboratory Courses," *Journal of Chemical Education*, submitted

PUBLICATIONS (*undergraduates & high school teachers underlined*)

92. Herrington, D.; Sweeder, R.; Daubernmire, P.; Bauer, C.; **Bretz, S.L.**; Bunce, D.; Carmel, J.; Cole, R.; DeKorver, B.; Kelly, R.; Lewis, S.; Oliver-Hoyo, M.; Ryan, S.; Stains, M.; Towns, M.; Yeziarki, E. "Supporting the Growth and Impact of the Chemistry Education Research Community," *Journal of Chemical Education*, submitted
91. Croisant, M.; **Bretz, S.L.**; Konkolewicz, D. "Investigating Radical Reactivity and Structure-Property Relationships through Photopolymerization," *Journal of Chemical Education*, revised and resubmitted
90. **Bretz, S.L.** "Equilibrium and Stress: Balancing One Marriage, a "Two-Body Problem," and Three Children, In *Mom the Chemistry Professor: Personal Accounts and Advice from Chemistry Professors who are Mothers*, 2nd edition (Cole, Marzabadi, Webster, and Wozniak, Eds.) Springer Press, **2018**, 57–74.
89. Cheng, Z.; VanPelt, J.; Bergstrom, A.; Bethel, C.; Katko, A.; Miller, C.; Mason, K.; Cumming, E.; Zhang, H.; Kimble, R.; Fullington, S.; **Bretz, S.L.**; Nix, J.C.; Bonomo, R.; Tierney, D.L.; Page, R.C.; Crowder, M.W. "A Non-Canonical Metal Center Drives Activity of the *Sediminispirochaeta smaragdinae* Metallo- β -lactamase SPS-1," *Biochemistry*, **2018**, 57(35), 5218-5229.
88. Popova, M.; **Bretz, S.L.** "Organic Chemistry Students' Interpretations of the Surface Features of Reaction Coordinate Diagrams," *Chemistry Education Research and Practice*, **2018**, 19, 919–931
87. Popova, M.; **Bretz, S.L.** "Organic Chemistry Students' Understandings of What Makes a Good Leaving Group," *Journal of Chemical Education*, **2018**, 95(7), 1094–1101
86. Popova, M.; **Bretz, S.L.** "It's Only the Major Product that We Care About in Organic Chemistry: An Analysis of Students' Annotations of Reaction Coordinate Diagrams," *Journal of Chemical Education*, **2018**, 95(7), 1086–1093. **ACS Editor's Choice**
85. Popova, M.; **Bretz, S.L.** "Organic Chemistry Students' Challenges with Coherence Formation between Reactions and Reaction Coordinate Diagrams," *Chemistry Education Research and Practice*, **2018**, 19, 732–745
84. Padilla Mercado, J.; Coombs, E.M.; De Jesus, J.P.; **Bretz, S.L.**; Danielson, N.D. "Iodine Coulometry of Various Reducing Agents Including Thiols with On-line Photocell Detection Coupled to a Multifunctional Chemical Analysis Station to Eliminate Student Endpoint Detection by Eye," *Journal of Chemical Education*, **2018**, 95(5), 777–782
83. Abell, T.N.; **Bretz, S.L.** "Dissolving Salts in Water: Students' Particulate Explanations of Temperature Changes," *Journal of Chemical Education*, **2018**, 95(4), 504–511.
82. **Bretz, S.L.**; Mayo, A.V.M. "Development of the Flame Test Concept Inventory: Measuring Student Thinking about Atomic Emission," *Journal of Chemical Education*, **2018**, 95(1), 17–27
81. Abell, T.N.; McCarrick, R.M.; **Bretz, S.L.**; Tierney, D.L. "Bis-Trispyrazolylborate Complexes: An Advanced Synthesis Experiment Using Paramagnetic NMR, Variable Temperature NMR, and EPR Spectroscopies," *Journal of Chemical Education*, **2017**, 94(12), 1960–1964.
80. **Bretz, S.L.** "Finding No Evidence for Learning Styles," *Journal of Chemical Education*, **2017**, 94(7), 825–826.
79. Padilla Mercado, J.B.; Konkolewicz, D.; **Bretz, S.L.**; Danielson, N.D. "Indirect Determination of Zinc by Thiol Complexation and Iodine Coulometric Titration with Photodiode Detection," *Microchemical Journal*, **2017**, 134, 119-124.
78. Allred, Z.R.; Tai, H.; **Bretz, S.L.**; Page, R.C. "Using PyMOL to Explore the Effects of pH on Non-Covalent Interactions between Immunoglobulin G and Protein A: A Guided-Inquiry Biochemistry Activity," *Biochemistry and Molecular Biology Education*, **2017**, 45(6), 528–536.
77. **Bretz, S.L.**; Galloway, K.R.; Orzel, J.; Gross, E. "Faculty Goals, Inquiry, and Meaningful Learning in the Undergraduate Chemistry Laboratory," *Technology and Assessment Strategies for Improving Student Learning in Chemistry*, M. Schultz, T.A. Holme; S. Schmid (Eds.), ACS Symposium Series, **2016**, Vol. 1236, 101-115.
76. Anzovino, M.E.; **Bretz, S.L.** "Organic Chemistry Students' Fragmented Ideas about the Structure and Function of Nucleophiles and Electrophiles: A Concept Map Analysis," *Chemistry Education Research and Practice*, **2016**, 17, 1019-1029
75. Popova, M.; **Bretz, S.L.**; Hartley, C.S. "Visualizing Molecular Chirality in the Organic Chemistry Laboratory using Cholesteric Liquid Crystals," *Journal of Chemical Education*, **2016**, 93(6), 981-1162 (**selected for Cover Feature**)
74. Galloway, K.R.; Malakpa, Z. **Bretz, S.L.** "Investigating Affective Experiences in the Undergraduate Chemistry Laboratory: Students' Perceptions about Control and Responsibility," *Journal of Chemical Education*, **2016**, 93(2), 227-238
73. Galloway, K.R.; **Bretz, S.L.** "Video Episodes and Action Cameras in the Undergraduate Chemistry Laboratory: Eliciting Student Perceptions of Meaningful Learning," *Chemistry Education Research and Practice*, **2016**, 17, 139-155
72. Galloway, K.R.; **Bretz, S.L.** "Measuring Meaningful Learning in the General Chemistry and Organic Chemistry Laboratories: A Longitudinal Study," *Journal of Chemical Education*, **2015**, 92(12), 2019-2030
71. Galloway, K.R.; **Bretz, S.L.** "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory: A National, Cross-Sectional Study," *Journal of Chemical Education*, **2015**, 92(12), 2006-2008
70. Galloway, K.R.; **Bretz, S.L.** "Using Cluster Analysis to Characterize Meaningful Learning in a First-Year University Chemistry Laboratory Course," *Chemistry Education Research and Practice*, **2015**, 16, 879-892

PUBLICATIONS (*undergraduates & high school teachers underlined*)

69. Anzovino, M.E.; **Bretz, S.L.** "Organic Chemistry Students' Ideas about Nucleophiles and Electrophiles: The Role of Charges and Mechanisms," *Chemistry Education Research and Practice*, **2015**, 16, 797-810
68. Linenberger, K.J.; **Bretz, S.L.** "Biochemistry Students' Ideas about how an Enzyme Interacts with a Substrate," *Biochemistry and Molecular Biology Education*, **2015**, 43(4), 213-222
67. Galloway, K.R.; **Bretz, S.L.** "Development of an Assessment Tool to Measure Students' Meaningful Learning in the Undergraduate Chemistry Laboratory," *Journal of Chemical Education*, **2015**, 92(7), 1149-1158
66. **Bretz, S.L.**; McClary, L.M. "Students' Understandings of Acid Strength: How Meaningful is Reliability when Measuring Alternative Conceptions?" *Journal of Chemical Education*, **2015**, 92(2), 212-219.
65. Galloway, K.R.; **Bretz, S.L.**; Novak, M. "Paper Chromatography and UV-VIS Spectroscopy to Characterize Anthocyanins and Investigate Anti-Oxidant Properties in the Organic Teaching Laboratory," *Journal of Chemical Education*, **2015**, 92(1), 183-188
64. **Bretz, S.L.** (2014). "Designing Assessment Tools to Measure Students' Conceptual Knowledge of Chemistry," *Tools of Chemistry Education Research*, D. Bunce and R. Cole (Eds.), ACS Symposium Series, Oxford University Press, 155-168
63. Brandriet, A.R.; **Bretz, S.L.** "Measuring Meta-Ignorance through the Lens of Confidence: Examining Students' Redox Misconceptions about Oxidation Numbers, Charge, and Electron Transfer," *Chemistry Education Research and Practice*, **2014**, 15(4), 729-746
62. Brandriet, A.R.; **Bretz, S.L.** "The Development of the Redox Concept Inventory as a Measure of Students' Symbolic and Particulate Redox Understandings and Confidence," *Journal of Chemical Education*, **2014**, 91(8), 1132-1144
61. **Bretz, S.L.** (2014). "Equilibrium and Stress: Balancing One Marriage, a "Two-Body Problem," and Three Children, In *Mom the Chemistry Professor: Personal Accounts and Advice from Chemistry Professors who are Mothers* (Cole, Marzabadi, Webster, and Woznack, Eds.) Springer Press, 3-19.
60. Luxford, C.J.; **Bretz, S.L.** "Development of the Bonding Representations Inventory to Identify Student Misconceptions about Covalent and Ionic Bonding Representations," *Journal of Chemical Education*, **2014**, 91(3), 312-320. **ACS Editors' Choice (1st ever article in J. Chem. Educ. to earn this distinction)**
59. Linenberger, K.J.; **Bretz, S.L.** "Biochemistry Students' Ideas about Shape and Charge in Enzyme-Substrate Interactions," *Biochemistry and Molecular Biology Education*, **2014**, 42(3), 203-212
58. **Bretz, S.L.** (2013). "A Chronology of Assessment in Chemistry Education," *Trajectories in Chemical Education*, M. Cooper, T. Holme, P. Varma-Nelson (Eds.), ACS Symposium Series Vol. 1145, 145-153.
57. Brandriet, A.R.; Ward, R.M.; **Bretz, S.L.** "Modeling Meaningful Learning in Chemistry using Structural Equation Modeling," *Chemistry Education Research and Practice*, **2013**, 14(4), 421-430.
56. Luxford, C.J.; **Bretz, S.L.** "Moving Beyond Textbook Definitions: Student-Centered Models of Covalent and Ionic Bonding," *Chemistry Education Research and Practice*, **2013**, 14, 214-222.
55. Harshman, J.T.; **Bretz, S.L.**; Yeziarski, E.J. "Seeing Chemistry through the Eyes of the Blind: A Case Study Examining Multiple Gas Law Representations," *Journal of Chemical Education*, **2013**, 90(6), 710-716.
54. Mayo, A.V.; **Bretz, S.L.**; Danielson, N.D. "Flow Injection Analysis and Liquid Chromatography for Multifunctional Chemical Analysis (MCA) Systems," *Journal of Chemical Education*, **2013**, 90(4), 500-505.
53. **Bretz, S.L.**; Fay, M.E.; Bruck, L.; Towns, M.H. "What Faculty Interviews Reveal about Meaningful Learning in the Undergraduate Chemistry Laboratory," *Journal of Chemical Education*, **2013**, 90(3), 281-288.
52. National Research Council. (2012). *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering*. Susan R. Singer, Natalie R. Nielsen, and Heidi A. Schweingruber, Editors. Committee on the Status, Contributions, and Future Directions of Discipline-Based Education Research. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academies Press. (committee members: S. Singer (Chair), R. Beichner, **S.L. Bretz**, M. Cooper, S. Decatur, J. Fairweather, K. Heller, K. Kastens, M. Martinez, D. Mogk, L. Novick, M. Osgood, T. Slater, K. Smith, W. Wood)
51. McClary, L.M.; **Bretz, S.L.** "Development and Assessment of a Diagnostic Tool to Identify Organic Chemistry Students' Alternative Conceptions Related to Acid Strength," *International Journal of Science Education*, **2012**, 34(15), 2317-2341.
50. Linenberger, K.J.; **Bretz, S.L.** "A Novel Technology to Investigate Students' Understandings of Enzyme Representations," *Journal of College Science Teaching*, **2012**, 42(1), 45-49
49. **Bretz, S.L.**; Linenberger, K.J. "Development of the Enzyme-Substrate Interactions Concept Inventory," *Biochemistry and Molecular Biology Education*, **2012**, 40(4), 229-233.
48. **Bretz, S.L.** "Navigating the Landscape of Assessment," *Journal of Chemical Education*, **2012**, 89(6), 689-691.
47. Grove, N.P.; **Bretz, S.L.** "A Continuum of Learning: From Rote Memorization to Meaningful Learning in Organic Chemistry," *Chemistry Education Research and Practice*, **2012**, 13, 201-208.
46. Emenike, M.E.; **Bretz, S.L.** "Hannah's Prior Knowledge about Chemicals: A Case Study of One 4th Grade Child," *School Science and Mathematics*, **2012**, 112(2), 99-108.
45. Linenberger, K.J.; **Bretz, S.L.** "Generating Cognitive Dissonance in Student Interviews through Multiple Representations," *Chemistry Education Research and Practice*, **2012**, 13, 161-171.

PUBLICATIONS (*undergraduates & high school teachers underlined*)

44. Luxford, C.J.; Crowder, M.W.; **Bretz, S.L.** "A Symmetry POGIL Activity for Inorganic Chemistry," *Journal of Chemical Education*, **2012**, 89(2), 211-214.
43. Gephart, J.A.; Emenike, M.E.; **Bretz, S.L.** "Greenwashing or Green Advertising? An Analysis of Print Ads for Food and Household Cleaning Products from 1960-2008," *Journal for Activism in Science & Technology Education*, **2011**, 3(2), 19-26.
42. Emenike, M.E.; Danielson, N.D.; **Bretz, S.L.** "Meaningful Learning in a First-Year Chemistry Laboratory Course: Differences across Classical, Discovery, and Instrumental Experiments," *Journal of College Science Teaching*, **2011**, 41(2), 84-92.
41. Jensen, J.D.; Grundy, S.; **Bretz, S.L.**; Hartley, C.S. "Synthesis and Characterization of Self-Assembled Liquid Crystals: p-Alkoxybenzoic Acids," *Journal of Chemical Education*, **2011**, 88, 1133-1136. (**Cover Feature**)
40. Bindis, M.P.; **Bretz, S.L.**; Danielson, N.D. "Preparation and Characterization of a Monolithic Column for use in HPLC: An Undergraduate Laboratory Experiment," *Journal of Chemical Education*, **2011**, 88, 675-678.
39. Brandriet, A.R.; Xu, X.; **Bretz, S.L.**; Lewis, J. "Diagnosing Changes in Attitude in First-Year College Chemistry: A Shortened Version of Bauer's Semantic Differential," *Chemistry Education Research and Practice*, **2011**, 12, 271-278.
38. Linenberger, K.J.; **Bretz, S.L.**; Crowder, M.W.; Lorigan, G.A.; Tierney, D. "What is Fresh Meat's True Color? A Biophysical Undergraduate Laboratory Experiment Investigating the Effects of Ligand Binding on Myoglobin Using Optical, Electron Paramagnetic Resonance and Nuclear Magnetic Resonance Spectroscopies," *Journal of Chemical Education*, **2011**, 88(2), 223-225.
37. Bruck, L.B.; **Bretz, S.L.**; Towns, M.H. "Faculty Perspectives of Undergraduate Chemistry Laboratory: Goals and Obstacles to Success," *Journal of Chemical Education*, **2010**, 87(12), 1416-1424.
36. Sanabria-Ríos, D.; **Bretz, S.L.** "Investigating the Relationship between Faculty Cognitive Expectations about Learning Chemistry and the Construction of Exam Questions," *Chemistry Education Research and Practice*, **2010**, 11, 212-217.
35. Grove, N.P.; **Bretz, S.L.** "Perry's Scheme of Intellectual and Epistemological Development as a Framework for Describing Student Difficulties in Learning Organic Chemistry," *Chemistry Education Research and Practice*, **2010**, 11, 207-211.
34. Smith, K.C.; Nakhleh, M.B.; **Bretz, S.L.** "An Expanded Framework for Analyzing General Chemistry Exams," *Chemistry Education Research and Practice*, **2010**, 11, 147-153.
33. Holme, T.; **Bretz, S.L.**; Cooper, M.; Lewis, J.; Pienta, N.; Stacy, A.; Stevens, R.; Towns, M.H. "Enhancing the Role of Assessment in Curriculum Reform in Chemistry," *Chemistry Education Research and Practice*, **2010**, 11, 92-97.
32. Bruck, L.B.; **Bretz, S.L.**; Towns, M.H. "A Rubric to Guide Curriculum Development of Undergraduate Chemistry Laboratory: Focus on Inquiry," in M. Gupta-Bhowon et al. (Eds.) *Chemistry Education in the ICT Age*, Springer, **2009**, 75-83.
31. Grove, N.P.; Collins, D.J.; López, J.J.; Guerin, N.P.; **Bretz, S.L.**; Zhou, H.-C. "Designing, Teaching, and Evaluating a Unit on Symmetry and Crystallography in the High School Classroom," *J. Chem. Educ.*, **2009**, 86(8), 946-949.
30. O'Donnell, M.E.; Musial, B.A.; Ca, D.; **Bretz, S.L.**; Danielson, N.D. "Discovering the Retention Mechanisms of Liquid Chromatography Using Solid Phase Extraction Cartridges," *J. Chem. Educ.*, **2009**, 86(1), 60-63.
29. Bautista, N.U; Winslow, J.; Nafziger, K.M.; Motter, B.M.; **Bretz, S.L.** "Integrating Science and Language Arts to Teach with Inquiry," in T. Poetter and J. Eagle (Eds.) *The Art and Science of Partnership: Catalytic Cases of Schools, University, and Community Renewal*, **2009**, University Press of America, 63-78.
28. Whitson, L.; **Bretz, S.L.**; Towns, M.H. "Characterizing the Level of Inquiry in the Undergraduate Laboratory," *J. Coll. Sci. Teaching*, **2008**, 37(7), 52-58.
27. **Bretz, S.L.** (editor) *Chemistry in the National Science Education Standards: Models for Meaningful Learning in the High School Chemistry Classroom* (2nd ed.), **2008**, American Chemical Society: Washington, D.C.
26. **Bretz, S.L.** "Teaching and Learning High School Chemistry" in *Chemistry in the National Science Education Standards: Models for Meaningful Learning in the High School Chemistry Classroom* (2nd ed.), **2008**, pp. 4-6, American Chemical Society: Washington, D.C.
25. Fay, M.E.; **Bretz, S.L.** "Structuring the Level of Inquiry in your Classroom," *The Science Teacher*, **2008**, 75(5), 38-42.
24. Mathew, J.M.; Grove, N.P.; **Bretz, S.L.** "Online Data Collection and Database Development for Survey Research in Chemistry Education," *Chemical Educator*, **2008**, 13, 190-194.
23. Grove, N.P.; Hershberger, J.W.; **Bretz, S.L.** "Impact of Spiral Organic Curriculum on Student Attrition and Learning," *Chemistry Education Research and Practice*, **2008**, 9, 157-162.
22. Grove, N.P.; **Bretz, S.L.** "Measuring What Students Know about How to Learn Chemistry," *Proceedings of the National STEM Assessment Conference*, National Science Foundation & Drury University, **2008**, 159-165.
21. **Bretz, S.L.** "Qualitative Research Designs in Chemistry Education Research" in D. Bunce and R. Cole (Eds.) *Nuts and Bolts of Chemical Education Research*, American Chemical Society Symposium Series, Oxford University Press, **2008**, 79-99.

PUBLICATIONS (*undergraduates & high school teachers underlined*)

20. Grove, N.P.; **Bretz, S.L.** "CHEMx: An Instrument to Assess Students' Cognitive Expectations for Learning Chemistry." *J. Chem. Educ.*, **2007**, 84(9), 1524-1529.
19. Hohloch, J.M.; Grove, N.P.; **Bretz, S.L.**; "Pre-Service Teacher as Researcher: The Value of Inquiry in Learning Science." *J. Chem. Educ.*, **2007**, 84(9), 1530-1534.
18. Fay, M.E.; Grove, N.P.; Towns, M.H.; **Bretz, S.L.** "A Rubric to Characterize Inquiry in the Undergraduate Chemistry Laboratory," *Chemistry Education Research and Practice*, **2007**, 8(2), 212-219.
17. Grove, N.P.; **Bretz, S.L.**; "Sherlock Holmes and the Case of the Immortal and the Raven: An Inquiry-Based Murder Mystery." *Journal of Chemical Education*, **2005**, 82(10), 1532-1533.
16. Hutchinson, K.M.; **Bretz, S.L.**; Mettee, H.D.; Smiley, J.A. "A Guided Inquiry Experiment for the Measurement of Activation Energies in the Physical or Biophysical Chemistry Laboratory: Decarboxylation of Pyrrole-2-carboxylate." *Biochemistry and Molecular Biology Education*, **2005**, 33(2), 123-127.
15. **Bretz, S.L.** "All Students Are Not Created Equal: Learning Styles in the Chemistry Classroom." in *Chemist's Guide to Effective Teaching*, Greenbowe, T.; Pienta, N.; Cooper, M. (eds), Pearson Prentice Hall, **2005**, 28-40.
14. **Bretz, S.L.** "Implementing the Professional Development Standards: An Innovative M.S. Degree for High School Chemistry Teachers," *J. Chem. Educ.*, **2002**, 79(11), 1307-1309.
13. **Bretz, S.L.**; Meinwald, J. "The Language of Chemistry," *J. Coll. Sci. Teaching*, **2001**, 31(4), 220-224.
12. **Bretz, S.L.** "Human Constructivism and Meaningful Learning," Online Symposium: Piaget, constructivism, and beyond. *J. Chem. Educ.*, **2001**, 78(8), 1107. Full text at <http://jchemed.chem.wisc.edu>.
11. **Bretz, S.L.** and Nakhleh, M.B. (Eds.) "Online Symposium: Piaget, constructivism, and beyond." *J. Chem. Educ.*, **2001**, 78(8), 1107. Full text at <http://jchemed.chem.wisc.edu>.
10. El-Ashmawy, A.K.; Birk, J.P.; **Bretz, S.L.**; Edverson, G.; Feng, D.; Frech, C.B.; Funck, L.L.; Golen, J.A.; Knight, D.A.; Kurland, D.B.; Paradis, J.; Peters, N.J.S.; Pulliam, E.; Reeves, J.H.; Rogers, P.J.; Sherwood, T.A.; Venkatasubban, K.S.; Wiegand, D.H.; Woodward, B.R. "American Chemical Society Division of Chemical Education General Chemistry Exam Form 1999," American Chemical Society, Division of Chemical Education, Examinations Institute, **1999** (exam is released, not published)
9. El-Ashmany, A.K.; Birk, J.; **Bretz, S.L.**; Coe, D.; Coppola, B.; Daily, W.; Edverson, G.; Finster, D.; Golen, J.; Hicks, W.; Nakhleh, M.B.; Peters, N.; Phillips, J.; Pulliam, E.; Reeves, J.; Rogers, P.; Samuel, P.; Sawrey, B.; Scharberg, M.; Sherwood, T.; Socol, T.; Venkatasubban, K.; Wiegand, D. "American Chemical Society Division of Chemical Education General Chemistry Exam Form 1997," American Chemical Society, Division of Chemical Education, Examinations Institute, **1997**. (exam is released, not published)
8. **Bretz, S.L.** "CiC and Concept Webs," *Chemistry News*, **1997**, 7(2), 18-19.
7. **Bretz, S.L.** "Evaluation: An Introduction to Why and How," *CHED Newsletter*, American Chemical Society Division of Chemical Education, Spring **1997**, pp. 8-11.
6. **Bretz, S.L.** "A Companion Syllabus for Molecules by Peter Atkins," *Chemistry: Molecules, Matter, and Change Instructor's Resource Manual*, W.H. Freeman, **1997**.
5. **Bretz, S.L.** "Concept Maps: A Metacognitive Tool for Teaching Students to Learn How to Learn," *Chemistry in Context Instructor's Resource Guide*, W.C. Brown, **1997**.
4. **Bretz, S.L.**; Bretz, R.L.; Clausen, C.A. Test Item File for *General Chemistry and General Chemistry with Qualitative Analysis* (10th ed.) by Robinson, Odom, and Holtzclaw, Houghton-Mifflin, **1997**.
3. Bommarito, S.L.; **Lowery Bretz, S.P.**; Abruña, H.D. "Homogeneous and Heterogeneous Synthesis of Redox Polymers and Copolymers of [M(4-vinyl-4'-methyl-2,2'-bipyridine)₃](PF₆)₂ (M=Ru,Os)," *Synlett*, **1993**, 6, 375.
2. Bommarito, S.L.; **Lowery Bretz, S.P.**; Abruña, H.D. "Synthesis and Characterization of Redox Copolymers of [Ru(4-vinyl-4'-methyl-2,2'-bipyridine)₃]²⁺ and [Os(4-vinyl-4'-methyl-2,2'-bipyridine)₃]²⁺: Unusual Energy Transfer Dynamics," *Inorganic Chemistry*, **1992**, 31, 502-507.
1. Bommarito, S.L.; **Lowery Bretz, S.P.**; Abruña, H.D. "Synthesis and Characterization of Redox Polymers of [M(4-vinyl-4'-methyl-2,2'-bipyridine)₃](PF₆)₂ (M=Ru,Os)," *Inorganic Chemistry*, **1992**, 31, 495-502.

INVITED SEMINARS

167. "Assessment of Students' Understandings of Enthalpy and Entropy Changes in the Context of Dissolving and Precipitation," Royal Society of Chemistry, Chemistry Education Research Group Webinar; May 2019
166. "Measuring Misconceptions: Student Understanding of Multiple Representations in Chemistry," University of South Florida, Department of Chemistry, February 14, 2019
165. "Measuring Misconceptions: Student Understanding of Multiple Representations in Chemistry," University of California San Diego, Department of Chemistry, January 14, 2019
164. "Improving Textbook Assessment Pedagogy through Chemistry Education Research," Nelson Sales Meeting, Niagara Falls, Ontario, December 11, 2018
163. "Assessment of Students' Understandings of Quantization and Probability using Representations of the Electronic Structure of the Atom," American Chemical Society, Midwest Regional Meeting, Ames, IA; October 22, 2018
162. "Assessment of Students' Understandings of Enthalpy and Entropy Changes in the Context of Dissolving and Precipitation," American Chemical Society, Midwest Regional Meeting, Ames, IA; October 21, 2018

INVITED SEMINARS

161. "Measuring Misconceptions: Student Understanding of Multiple Representations in Chemistry," Ball State University, Department of Chemistry & Biochemistry, October 11, 2018
160. "Measuring Misconceptions: Students' Understandings of Multiple Representations in Chemistry," SUNY Cortland, Department of Chemistry & Biochemistry, September 17, 2018
159. "Equilibrium and Stress: Balancing One Marriage, a 'Two-Body' Problem, and Three Children," 256th American Chemical Society National Meeting, Boston, MA; August 2018
158. "Development of the Flame Test Concept Inventory: Measuring Student Thinking about Atomic Emission," 256th American Chemical Society National Meeting, Boston, MA; August 19, 2018
157. "Equilibrium and Stress: Balancing One Marriage, a 'Two-Body' Problem, and Three Children," Biennial Conference on Chemical Education, University of Notre Dame, July 30, 2018
156. "Chemistry Education Research as a Graduate Discipline: What Constitutes Critical Mass?" Biennial Conference on Chemical Education, University of Notre Dame, July 29, 2018
155. "Measuring Misconceptions: Student Understanding of Multiple Representations in Chemistry," Texas Tech University, Department of Chemistry & Biochemistry, April 4, 2018
154. "Inquiry and Meaningful Learning in the Undergraduate Chemistry Laboratory," Texas Tech University, Department of Chemistry & Biochemistry, April 4, 2018
153. "Measuring Misconceptions: Student Understanding of Multiple Representations in Chemistry," Keynote Speaker, 219th 2YC3 Conference, Delgado Community College, New Orleans, LA, March 17, 2018
152. "Inquiry and Meaningful Learning in the Undergraduate Chemistry Laboratory," 12th Annual Tennessee STEM Education Research Conference, Keynote Address, Middle Tennessee State University, February 1, 2018
151. "Chemistry Education Research: What Constitutes Critical Mass in the U.S.?" Gordon Research Conference, Chemistry Education Research and Practice, June 21, 2017
150. "Meaningful Learning and Learning to Mentor," ACS Award Symposium for Achievement in Research in Teaching and Learning of Chemistry, 251st American Chemical Society National Meeting, San Francisco, CA; April 3, 2017
149. "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory," Iowa State University, Department of Chemistry, March 28, 2017
148. "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory," Kenyon College, Department of Chemistry, March 21, 2017
147. "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory," Rochester Institute of Technology, Department of Chemistry; March 3, 2017
146. "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory," Michigan State University, Department of Chemistry & Biochemistry; November 2, 2016
145. "Improving Meaningful Learning in Undergraduate STEM Education: One Chemist's Vision," National Science Foundation, Division of Undergraduate Education, Arlington, VA, October 25, 2016
144. "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory," Miami University, Department of Chemistry & Biochemistry; September 8, 2016
143. "Improving Textbook Assessment Pedagogy through Chemistry Education Research," W.W. Norton Sales Meeting, Portland, OR, August 4, 2016
142. "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory: The Gap between Faculty Expectations and Students' Experiences," 99th Canadian Chemistry Conference and Exhibition, Halifax, Nova Scotia; June 6, 2016
141. "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory," Wright State University, Department of Chemistry; March 25, 2016
140. "Measuring Misconceptions: Student Understanding of Multiple Representations in Chemistry," NSF Curricular Innovations Symposium, 249th American Chemical Society National Meeting, San Diego, CA; March 14, 2016
139. "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory," ACS Award Symposium for Achievement in Research in Teaching and Learning of Chemistry, 251st American Chemical Society National Meeting, San Diego, CA; March 14, 2016
138. "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory," International Chemical Congress of Pacific Basin Societies (PacifiChem), Honolulu, HI, December 19, 2015
137. "Measuring Misconceptions: Student Understanding of Multiple Representations in Chemistry," University of Georgia, Department of Chemistry, October 25, 2015
136. "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory," University of Iowa, Department of Chemistry, September 11, 2015
135. "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory," 98th Canadian Chemistry Conference and Exhibition, Ottawa, Canada; June 15, 2015
134. "Measuring Misconceptions: Student Understanding of Multiple Representations in Chemistry," Keynote Speaker, ACS Upper Ohio Valley Local Section Awards Night, April 7, 2015
133. "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory," Ohio University, Department of Chemistry, April 6, 2015

INVITED SEMINARS

132. "Measuring Misconceptions: Student Understanding of Multiple Representations in Chemistry," Keynote Speaker, ACS Cincinnati Local Section Awards Night, March 18, 2015
131. "Measuring Student Understanding of Multiple Representations," 2014 Annual MACTLAC (Midwestern Association of Chemistry Teachers at Liberal Arts Colleges) Meeting, Keynote Speaker, October 24, 2014
130. "Measuring Meaningful Learning in the Undergraduate Chemistry Laboratory," 2014 SERMACS (Southeast Regional ACS) Meeting, Nashville, TN, October 17, 2014
129. "Measuring Student Understanding of Multiple Representations," Duke University, September 2, 2014
128. "Equilibrium and Stress: Balancing One Marriage, a "Two-Body Problem," and Three Children," 248th American Chemical Society National Meeting, San Francisco, CA; August 11, 2014
127. "Designing Assessment Items to Measure Chemistry Students' Understandings of Multiple External Representations," 23rd IUPAC International Conference on Chemistry Education, Keynote Speaker, Toronto, ON, July 13, 2014
126. "Measuring Student Understanding of Multiple Representations," Miami University, May 8, 2014
125. "Chemistry Misconceptions and Concept Inventories: Students' Interpretations of Multiple Representations," Loyola University Chicago, April 10, 2014
124. "Developing Assessment Items to Measure Students' Understanding of Multiple External Representations in Chemistry," National Association for Research in Science Teaching, Pittsburgh, PA; March 30, 2014
123. "Designing Assessment Tools to Measure Students' Conceptual Knowledge of Chemistry," ACS Award Symposium for Achievement in Research in Teaching and Learning of Chemistry, 247th American Chemical Society National Meeting, Dallas, TX; March 19, 2014
122. "Measuring Student Perceptions of Meaningful Learning in the Undergraduate Chemistry Laboratory," 247th American Chemical Society National Meeting, Dallas, TX; March 18, 2014
121. "Measuring Student Understanding of Multiple Representations," University of Puerto Rico Rio Piedras, February 14, 2014
120. "Measuring Student Understanding of Multiple Representations," University of Puerto Rico Cayey, February 13, 2014
119. "Measuring Student Understanding of Multiple Representations," Doris Bergen Center for Human Development, Learning, and Thinking, Miami University, October 16, 2013
118. "MLIL: Assessment of Meaningful Learning in the Undergraduate Chemistry Laboratory," 246th American Chemical Society National Meeting, Indianapolis, IN, September 2013
117. "Assessing Students' Confidence in their Understanding of Particulate and Symbolic Oxidation-Reduction Reactions using the Redox Concept Inventory (ROXCI)," 246th American Chemical Society National Meeting, Indianapolis, IN, September 2013
116. "Measuring Student Understanding of Multiple Representations," Gordon Research Conference, Chemistry Education Research and Practice, June 2013
115. "Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering," 101st 2YC3 Conference, May 21, 2013
114. "Assessment of Particulate Thinking and Misconceptions," ACS Award Symposium for Achievement in Research in Teaching and Learning of Chemistry, 245th American Chemical Society National Meeting, New Orleans, LA, April 2013
113. "Chemistry Misconceptions and Concept Inventories: Students' Interpretations of Multiple Representations," University of Nebraska, Lincoln, NE, November 30, 2012
112. "Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering," University of Nebraska, Lincoln, NE, November 29, 2012
111. "Chemistry Misconceptions and Concept Inventories: Students' Interpretations of Multiple Representations," Stanford University, Palo Alto, CA, November 1, 2012
110. "Chemistry Misconceptions and Concept Inventories: Students' Interpretations of Multiple Representations," College of Wooster, Wooster, OH, September 11, 2012
109. "Emerging Best Practices in Assessment: What Constitutes a Good Measure of a Good Measure?" Guiding the Trajectory of Chemistry Education Reform: A Symposium in Honor of Susan Hixson, 244th American Chemical Society National Meeting, Philadelphia, PA, August 21, 2012
108. "Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering," Transforming Research in Undergraduate STEM Education (TRUSE) Conference; University of St. Thomas, St. Paul, MN, June 2012
107. "Chemistry Misconceptions, Concept Inventories, and Measuring Student Learning," Walter E. Harris Teaching Workshops, Plenary Speaker, University of Alberta, Alberta, CA, May 24, 2012
106. "Learning Chemistry through Inquiry: Engaging Underprepared Math Students," Chemical Institute of Canada, Edmonton Local Section, May 23, 2012
105. "Measuring What Students Know: Misconceptions and Concept Inventories in Chemistry," University of North Carolina Wilmington, October 21, 2011
104. "Measuring What Students Know: Misconceptions and Concept Inventories in Chemistry," 2YC3 Conference, Stark Community College, May 20, 2011

INVITED SEMINARS

103. "Measuring What Students Know: Misconceptions and Concept Inventories in Chemistry," Rochester Institute of Technology, April 6, 2011
102. "Measuring What Students Know about Chemistry," 241st American Chemical Society National Meeting, Anaheim, CA, March 2011
101. "Inquiry in the Undergraduate Chemistry Laboratory: Faculty Goals and Perspectives," NSF CCLI PI Conference, Washington, D.C., January 27, 2011
100. "Learning Chemistry through Inquiry: Engaging Underprepared Math Students," University of California San Diego, January 9, 2011
99. "Frontiers of Chemistry Education Research," University of Iowa, November 19, 2010
98. "Learning Chemistry through Inquiry: Engaging Underprepared Math Students," Virginia Commonwealth University, October 28, 2010
97. "Learning Chemistry through Inquiry: Engaging Underprepared Math Students," University of Michigan-Dearborn, September 24, 2010
96. "Learning Chemistry through Inquiry: Engaging Underprepared Math Students," Transforming Research in Undergraduate STEM Education (TRUSE) Conference; University of Maine, June 2010
95. "Navigating Frontiers and Catalyzing Change: Examining the Challenges and Rewards of Scholarship of Teaching and Learning," Keynote Speaker, SoTL Workshop, Western Michigan University, May 21, 2010
94. "Learning Chemistry through Inquiry: Engaging Underprepared Math Students," Nazareth College, April 9, 2010
93. "Building a Collaborative Model for Data-Driven Reform in Chemistry Education," NSF-Catalyzed Innovations Symposium, 239th American Chemical Society National Meeting, San Francisco, CA, March 21, 2010
92. "Cognitive and Affective Learning in General Chemistry: The Case of POGIL Recitations for Weaker Math Students," 239th American Chemical Society National Meeting, San Francisco, CA, March 24, 2010
91. "Designing Instruments for Chemistry Education Research," Assessment Institute, Indianapolis, IN, October 27, 2009
90. "Designing Instruments for Chemistry Education Research," University of Iowa, September 25, 2009
89. "Learning Chemistry through Inquiry: Engaging Underprepared Math Students," Wabash College, August 17, 2009
88. "Improving Retention in General Chemistry: POGIL Recitations for Weaker Math Students," 237th American Chemical Society National Meeting, Salt Lake City, UT, March 24, 2009
87. "Learning Chemistry through Inquiry: Engaging Underprepared Math Students," 12th Annual Research in Undergraduate Mathematics Education Conference of the Mathematical Association of America, Plenary Speaker, Raleigh, NC, February 28, 2009
86. "Designing Instruments for Chemistry Education Research," Virginia Tech University, October 24, 2008
85. "Designing Instruments for Chemistry Education Research," Clemson University, October 23, 2008
84. "Developing Assessment Tools in a Discipline," NSF CCLI Conference, Washington, D.C., August 14, 2008
83. "Improving Retention in General Chemistry: POGIL Recitations for Weaker Math Students," 20th Biennial Conference on Chemical Education, Indiana University, July 2008
82. "Improving Retention in General Chemistry: POGIL Recitations for Weaker Math Students," POGIL National Meeting, University of Texas, June 1, 2008
81. "Faculty perspectives of pedagogy, curriculum, and assessment in undergraduate laboratory," 235th American Chemical Society National Meeting, New Orleans, LA, April 9, 2008
80. "Investigating Children's Ideas about Chemicals," Award Symposium for 235th American Chemical Society National Meeting, New Orleans, LA, April 7, 2008
79. "Chemistry Education Research," ACS Award Symposium for Achievement in Research in Teaching and Learning of Chemistry for 235th American Chemical Society National Meeting, New Orleans, LA, April 7, 2008.
78. "Improving Retention in General Chemistry: POGIL Recitations for Weaker Math Students," 235th American Chemical Society National Meeting, New Orleans, LA, April 6, 2008
77. "Designing Instruments for Chemistry Education Research," Purdue University, February 28, 2008
76. "Designing Instruments for Chemistry Education Research," University of Massachusetts Boston, February 6, 2008
75. "Designing Instruments for Chemistry Education Research," Wake Forest University, January 23, 2008
74. "Characterizing Inquiry in the Undergraduate Chemistry Laboratory: A Rubric to Aid Curriculum Development and Evaluation," 234th American Chemical Society National Meeting, Boston, MA, August 2007
73. "Designing Instruments for Chemistry Education Research," Gordon Research Conference on Chemistry Education Research and Practice, Connecticut College, June 24, 2007
72. "Making the Case for Forensics in the Chemistry Classroom," American Chemical Society Central Regional Meeting, Northern Kentucky University, May 22, 2007
71. "Standing on the Shoulders of a Giant: J. Dudley Herron, Jean Piaget, and Beyond," 233rd American Chemical Society National Meeting, Award Symposium for Chicago, IL, March 23, 2007
70. "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," West Virginia University, January 24, 2007
69. "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," National STEM Assessment Conference, National Science Foundation, Arlington, VA, October 20, 2006

INVITED SEMINARS

68. "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," University of Southern Florida, September 28, 2006
67. "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," Grand Valley State University, September 22, 2006
66. "All Students Are Not Created Equal: Learning Styles in the Chemistry Classroom," Andrews University, September 21, 2006
65. "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," American Association of Physics Teachers, Summer 2006 Conference, Syracuse, NY, July 23, 2006
64. "Pre-Service Teacher as Researcher: The Value of Inquiry in Learning Science," American Chemical Society K-8 Summer Conference "Developing a One-Semester Course Specifically Designed for Pre-service Elementary and Middle School Teachers," Washington, D.C.; July 15, 2006
63. "All Students Are Not Created Equal: Learning Styles in the Chemistry Classroom," California University of Pennsylvania, April 27, 2006
62. "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," 231st American Chemical Society National Meeting, Atlanta, GA, March 28, 2006
61. "Chemistry as a Foreign Language: Using Case Studies to Teach on a 'Need-to-Know' Basis," Otterbein College, April 8, 2006
60. "Navigating Frontiers and Catalyzing Change: Examining the Challenges and Rewards of Scholarship of Teaching and Learning," Keynote Address at Doing SoTL Conference, Otterbein College, April 8, 2006
59. "Using Concept Mapping to Improve Student Learning," College of Wooster, February 13, 2006
58. "All Students Are Not Created Equal: Learning Styles in the Chemistry Classroom," Austin Peay State University, February 3, 2006
57. "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," Eastern Michigan University, November 14, 2005
56. "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," Keynote Address at University of Wisconsin System Chemistry Faculties Meeting, University of Wisconsin-Washington County, October 15, 2005
55. "Teaching by Inquiry means Learning through Inquiry: Professional Development for High School Chemistry Teachers," Northeastern Illinois University, February 22, 2005
54. "Measuring Meaningful Learning: Assessment and Chemistry Education Research," Miami University, February 14, 2005
53. "Integrating Pedagogy and Content: The Role of Prior Knowledge and Cognitive Expectations in Teaching Chemistry," Purdue University, December 1, 2004
52. "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," American Chemical Society 28th Senior Technical Meeting, Isabela, Puerto Rico, November 19, 2004
51. "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," Brigham Young University, November 15, 2004
50. "From Serendipity to Strategy: One Career in Chemistry Education Research," Presidential Symposium – Younger Chemists' Committee, 228th American Chemical Society National Meeting, Philadelphia, PA, August 23, 2004
49. "Teaching by Inquiry means Learning through Inquiry: Professional Development for High School Chemistry Teachers," High School Teachers' Day, 228th American Chemical Society National Meeting, Philadelphia, PA, August 22, 2004
48. "The Scholarship of Teaching & Learning: Mechanisms for Meaningful Learning in Chemistry," Youngstown State University, CATALYST Institute for Teacher-Scholars, August 10, 2004
47. "All Students Are Not Created Equal: Learning Styles in the Chemistry Classroom," 18th Biennial Conference on Chemical Education, Iowa State University, July 18, 2004
46. "Ohio Academic Content Standards: A Critical View of Teaching and Learning Chemistry," American Chemical Society Central Regional Meeting, Indianapolis, IN, June 4, 2004
45. "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," American Chemical Society Central Regional Meeting, Indianapolis, IN, June 2, 2004
44. "Professional Development of Teachers as Researchers: Integrating Pedagogy and Content through Research in Chemistry Education," San Francisco State University, April 30, 2004
43. "The Scholarship of Teaching and Learning: Mechanisms for Meaningful Learning in Chemistry," University of Toledo, Center for Teaching and Learning, April 14, 2004
42. "Atoms, Molecules, & Receptors: How Does Your Nose Know? Teaching Chemistry on a 'Need to Know' Basis," University of Toledo, April 14, 2004
41. "Using Concept Mapping to Improve Student Learning," Youngstown State University, Center for the Advancement of Teaching and Learning (CATALYST), March 19, 2004
40. "Chemistry Education Research: A National Model for Professional Development of High School Chemistry Teachers," Ohio State University, March 16, 2004
39. "Inquiry Matters: Incorporating Inquiry into Physical Science Teaching," Ohio State University, November 20, 2003

INVITED SEMINARS

38. "Professional Development of Teachers as Researchers: Integrating Pedagogy and Content through Research in Chemistry Education," University of Cincinnati, November 14, 2003
37. "Using Concept Mapping to Improve Student Learning," University of Akron, Center for Collaboration and Inquiry, October 1, 2003
36. "Is Success a State Function? One Woman, a Two-body Problem, and Three Children," 226th American Chemical Society National Meeting, New York, NY, September 10, 2003
35. "The Scholarship of Teaching & Learning: Mechanisms for Meaningful Learning in Chemistry," Youngstown State University, CATALYST Institute for Teacher-Scholars, August 7, 2003
34. "Professional Development for High School Chemistry Teachers: Integrating Pedagogy and Content through Action Research," University of Maine, April 24, 2003
33. "Atoms, Molecules, & Receptors: How Does Your Nose Know? Teaching Chemistry on a 'Need to Know' Basis," University of Akron, April 16, 2003
32. "Community & Communication for Professional Development: High School Chemistry Teachers & Chemistry Education Research," 225th American Chemical Society National Meeting, Presidential Symposium, New Orleans, LA, March 24, 2003
31. "The Scholarship of Teaching and Learning: Mechanisms for Meaningful Learning in Chemistry," California State University Northridge, March 5, 2003
30. "Professional Development for High School Chemistry Teachers: Integrating Pedagogy and Content through Action Research," DePaul University, January 23, 2003
29. "Integrating Action Research into Teacher Education: Two Case Studies," U.S. Department of Education FIPSE Project Directors' Meeting, November 23, 2002
28. "Professional Development for High School Chemistry Teachers: Integrating Pedagogy and Content through Action Research," Ohio State University, November 15, 2002
27. "The Importance of Reflection in Learning Chemistry," John Carroll University, September 18, 2002
26. "Learning Strategies & Science Literacy: The Implications for Teaching Chemistry with Case Studies," 17th Biennial Conference on Chemical Education, Western Washington University, July 31, 2002
25. "High School Chemistry Teachers as Graduate Students: A Case Study in Evaluation," Gordon Research Conference on Innovations in College Chemistry Teaching, Connecticut College, June 25, 2002
24. "Collaborative Investigations for Learning Chemistry: Pre-Service Teachers and Learning through Inquiry," Northeast Ohio Title II Regional Conference on Teacher Quality, University of Akron, April 27, 2002
23. "Meaningful Learning and Assessment in Chemistry Education," University of Illinois at Chicago, Chicago, IL, April 11, 2002
22. "Constructivism in the Science Classroom: Hands-On Inquiry for Minds-On Learning," Sharpsville School District, Sharpsville, PA, February 15, 2002
21. "Meaningful Learning in General Chemistry: Making Connections through Concept Maps," Indiana University of Pennsylvania, Indiana, PA, February 8, 2002
20. "Meaningful Learning and Assessment in Chemistry Education," University of Northern Colorado, Greeley, CO, January 25, 2002
19. "Atoms, Molecules, and Receptors: How Does Your Nose Know? Teaching on a Need-to-Know Basis," ACS Milwaukee Section Annual Education Banquet, Milwaukee, WI, April 27, 2001
18. "The Importance of Reflection in Learning Chemistry: Using Concept Maps to Make Connections," University of Cincinnati, December 8, 2000
17. "Assimilation Theory and Meaningful Learning: Implications for Chemistry Teaching and Educational Research," 16th Biennial Conference on Chemical Education, University of Michigan, August 2, 2000.
16. "Synergism in the Classroom: Curriculum Reform & Chemical Education Research," Youngstown State University, March 1, 2000
15. "Measuring Meaningful Learning: Changing the Paradigm in Chemistry Education Research," Oakland University, January 19, 2000
14. "Synergism in the Classroom: Curriculum Reform & Chemical Education Research," George Washington University, December 1, 1999
13. "Measuring Meaningful Learning: Changing the Paradigm in Chemistry Education Research," United States Naval Academy, November 15, 1999
12. "The Importance of Shared Meaning: Meaningful Learning through Concept Maps," University of Illinois at Chicago, September 24, 1999
11. "Measuring Meaningful Learning: Changing the Paradigm in Chemistry Education Research," University of Wisconsin-Milwaukee, December 2, 1998
10. "Jigsaw: A Strategy for Improving Student Learning in the Large Lecture Course," Targeting Institutional Change: Quality Undergraduate Science Education for All Students, American Association for Higher Education, November 21, 1998
9. "Great Expectations: Navigating the Tenure-Track in Chemistry Education," 15th Biennial Conference on Chemical Education, University of Waterloo, August 12, 1998

INVITED SEMINARS (*cont'd*)

8. "Atoms, Molecules, and Receptors: How Does Your Nose Know?" Middle Atlantic Discovery Chemistry Project (MADCP), Franklin & Marshall College, June 15, 1998
7. "Assimilation Theory and Meaningful Learning: Implications for Chemistry Teaching and Educational Research," 215th American Chemical Society National Meeting, Dallas, TX, March 31, 1998
6. "Chemistry Conversations & Student Journals: Simultaneous Affective Assessment and Formative Evaluation," Ball State University, October 23, 1997
5. "Chemistry Conversations & Student Journals: Simultaneous Affective Assessment and Formative Evaluation," Purdue University, October 22, 1997
4. "Reforms in Pedagogy and Assessment: A Synergistic Challenge," Michigan Statewide Systemic Initiative Conference, Calvin College, June 6, 1996
3. "Cooperative Learning through Concept Mapping: Assessing Student Learning," Project Kaleidoscope Workshop, Hendrix College, September 29, 1995
2. "Learning Strategies, Science Literacy, and Meaningful Learning: Their Interplay and Implications for College Chemistry," University of California, San Diego, February 17, 1995
1. "The Role of Meaningful Learning in Promoting Science Literacy Among Undergraduate Nonscience Majors in an Introductory Chemistry Course," University of California, Berkeley, Department of Chemistry, March 18, 1994

RESEARCH POSTERS (*undergraduates & high school teachers underlined*)

170. Atkinson, M.B.; Croisant, M.F.; **Bretz, S.L.** "An Inventory to Measure Student Thinking about Reaction Coordinate Diagrams," 257th American Chemical Society National Meeting, Orlando, FL; April 1, 2019
169. Huff, L.; Allred, Z.R.; **Bretz, S.L.** "Development of an Inventory to Measure Students' Understandings of Elements and Compounds using Particulate Representations," 257th American Chemical Society National Meeting, Orlando, FL; April 1, 2019
168. Speiser, C.; Allred, Z.R.; **Bretz, S.L.** "Administration of the Flame Test Concept Inventory with Confidence Scale to General Chemistry Students," 257th American Chemical Society National Meeting, Orlando, FL; April 1, 2019
167. Dobbs, C.; Abell, T.; **Bretz, S.L.** "Development of an Assessment to Measure Students' Understandings of Solution Concentration," 257th American Chemical Society National Meeting, Orlando, FL; April 1, 2019
166. Yeziarski, K.; Abell, T.; Allen, G.H.; **Bretz, S.L.** "Assessing Students' Misconceptions using the Acid-Base, Redox, and Bonding Concept Inventory," 257th American Chemical Society National Meeting, Orlando, FL; April 1, 2019
165. Ferguson, K.; Abell, T.; Popova, M.; **Bretz, S.L.** "General Chemistry Students' Reasoning about Bonding: Translating between Symbolic and Space-Filling Representations of a Combustion Reaction," 257th American Chemical Society National Meeting, Orlando, FL; April 1, 2019
164. Weaver, K.; Reeves, J.; Yeziarski, E.; **Bretz, S.L.**; Konkolewicz, D. "Developing an Undergraduate Lab that Informs How Experimental Data Guide the Development of Reaction Mechanisms," 257th American Chemical Society National Meeting, Orlando, FL; April 1, 2019
163. Abell, T.; **Bretz, S.L.** "How General Chemistry and Physical Chemistry Students use Enthalpy and Entropy to Reason about Dissolving and Precipitation," 257th American Chemical Society National Meeting, Orlando, FL; March 31, 2019
162. Croisant, M.; **Bretz, S.L.** "Investigating Students' Thinking about the Connections among Kinetics, Thermodynamics, and Reaction Coordinate Diagrams," 257th American Chemical Society National Meeting, Orlando, FL; March 31, 2019
161. Fullington, S.; Bretz, S.L. "Students' Responses to Making Mistakes in the Undergraduate Chemistry Teaching Laboratory," 257th American Chemical Society National Meeting, Orlando, FL; March 31, 2019
160. Allred, Z.R.; **Bretz, S.L.** "Implementation of the Quantization and Probability Representations Inventory across the United States," 257th American Chemical Society National Meeting, Orlando, FL; March 31, 2019
159. Marko, J.; **Bretz, S.L.** "Students' Explanations and Molecular-Level Descriptions of Observations Involving Colligative Properties," 257th American Chemical Society National Meeting, Orlando, FL; March 31, 2019
158. Huff, L.; Allred, Z.R.; **Bretz, S.L.** "Students' Understandings of Particulate Representations of Elements and Compounds," 255th American Chemical Society National Meeting, New Orleans, LA; March 19, 2018
157. DeLuca, M.; Cortes, K.L.; Allen, G.; Allred, Z.R.; **Bretz, S.L.** "A Cluster Analysis of Biochemistry Students' Misconceptions about Enzyme-Substrate Interactions," 255th American Chemical Society National Meeting, New Orleans, LA; March 19, 2018
156. Dobbs, C.; Abell, T.; **Bretz, S.L.** "Students' Understandings of Solution Concentration," 255th American Chemical Society National Meeting, New Orleans, LA; March 19, 2018
155. Ferguson, K.; Popova, M.; **Bretz, S.L.** "Symbolic and Space-Filling Representations of a Combustion Reaction: General Chemistry Students' Reasoning about Bonding," 255th American Chemical Society National Meeting, New Orleans, LA; March 19, 2018
154. Speiser, C.; Mayo, A.V.M.; Allen, G.; **Bretz, S.L.** "Students' Understandings of Atomic Emission using the Flame Test Concept Inventory," 255th American Chemical Society National Meeting, New Orleans, LA; March 19, 2018

RESEARCH POSTERS (*undergraduates & high school teachers underlined*)

-
153. Croisant, M.; **Bretz, S.L.** "Investigating Students' Conceptions of Chemical Kinetics and Reaction Coordinate Diagrams" 255th American Chemical Society National Meeting, New Orleans, LA; March 18, 2018
152. Abell, T.N.; **Bretz, S.L.** "Development of a Concept Inventory to Assess Students' Understandings of Enthalpy and Entropy Changes in the Context of Dissolving and Precipitation," 255th American Chemical Society National Meeting, New Orleans, LA; March 18, 2018
151. Allred, Z.R.; **Bretz, S.L.** "Development of an Inventory to Measure Students' Understandings of Quantization and Probability Using Representations of the Electronic Structure of the Atom," 255th American Chemical Society National Meeting, New Orleans, LA; March 18, 2018
150. Popova, M.; **Bretz, S.L.** "Organic Chemistry Students' Challenges with Making Connections between Reactions and Reaction Coordinate Diagrams," 255th American Chemical Society National Meeting, New Orleans, LA; March 18, 2018
149. Allred, Z.R.; Tai, H.; **Bretz, S.L.**; Page, R.C. "Exploring the Effect of pH on Non-Covalent Interactions in Proteins using Molecular Visualization Software: A Guided Inquiry Biochemistry Activity," American Society for Biochemistry and Molecular Biochemistry, Tampa, FL; July 2017
148. Allred, Z.R.; **Bretz, S.L.** "Students' Ideas about Probability, Energy Quantization, and Electronic Structure" Transforming Research in Undergraduate STEM Education Conference, University of St. Thomas, St. Paul, MN; July 2017
147. Abell, T.N.; **Bretz, S.L.** "Connecting Students' Macroscopic Observations to Enthalpy and Entropy Changes in Dissolving and Precipitation Reactions," Transforming Research in Undergraduate STEM Education Conference, University of St. Thomas, St. Paul, MN; July 2017
146. Popova, M.; **Bretz, S.L.** "Organic Chemistry Students' Understandings of Connections between Reactions and Reaction Coordinate Diagrams," Transforming Research in Undergraduate STEM Education Conference, University of St. Thomas, St. Paul, MN; July 2017
145. Allen, G.H.; **Bretz, S.L.** "Connecting Students' Misconceptions about Bonding Concepts, Acid/Base Reactions, and Redox Reactions," Transforming Research in Undergraduate STEM Education Conference, University of St. Thomas, St. Paul, MN; July 2017
144. Allred, Z.R.; **Bretz, S.L.** "Students' Understandings of Probability in the Electron Structure of the Atom," NSF Chemistry Education Research Graduate Student and PostDoc Professional Development Conference, Miami University, Oxford, OH; June 2017
143. Abell, T.N.; **Bretz, S.L.** "Connecting Students' Macroscopic Observations to Enthalpy and Entropy Changes in Dissolving and Precipitation Reactions," NSF Chemistry Education Research Graduate Student and PostDoc Professional Development Conference, Miami University, Oxford, OH; June 2017
142. Popova, M.; **Bretz, S.L.** "Organic Chemistry Students' Understandings of Connections between Reactions and Reaction Coordinate Diagrams," NSF Chemistry Education Research Graduate Student and PostDoc Professional Development Conference, Miami University, Oxford, OH; June 2017
141. Allen, G.H.; Glinos, L.; **Bretz, S.L.** "Connecting Students' Misconceptions about Bonding to Acid/Base and Redox Reactions using Cluster Analysis," NSF Chemistry Education Research Graduate Student and PostDoc Professional Development Conference, Miami University, Oxford, OH; June 2017
140. Allred, Z.R.; **Bretz, S.L.** "Students' Interpretations of Multiple Representations of the Helium Atom," Gordon Research Conference on Chemistry Education Research and Practice, Bates College, Lewiston, ME; June 2017
139. Abell, T.N.; **Bretz, S.L.** "Connecting Students' Macroscopic Observations to Enthalpy and Entropy Changes in Dissolving and Precipitation Reactions," Gordon Research Conference on Chemistry Education Research and Practice, Bates College, Lewiston, ME; June 2017
138. Popova, M.; **Bretz, S.L.** "Finding Connections between Reactions and Reaction Coordinate Diagrams: Organic Chemistry Students' Understandings of Kinetic and Thermodynamic Considerations," Gordon Research Conference on Chemistry Education Research and Practice, Bates College, Lewiston, ME; June 2017
137. Allen, G.H.; Glinos, L.; **Bretz, S.L.** "Characterizing Students' Misconceptions about Representations of Bonding and Reactions: Insights from Cluster Analysis and Latent Class Analysis," Gordon Research Conference on Chemistry Education Research and Practice, Bates College, Lewiston, ME; June 2017
136. Popova, M.; **Bretz, S.L.** "Organic Chemistry Students' Understandings of Molecular Stability and Reactivity in the Context of Substitution Reactions," 253rd American Chemical Society National Meeting, San Francisco, CA; April 2, 2017
135. Abell, T.N.; **Bretz, S.L.** "Enthalpy and Entropy Changes in Dissolving and Precipitation Reactions: Students' Macroscopic Observations and Explanations," 253rd American Chemical Society National Meeting, San Francisco, CA; April 2, 2017
134. Allred, Z.R.; **Bretz, S.L.** "Students' Understandings of Atomic Orbital Representations for Carbon" 253rd American Chemical Society National Meeting, San Francisco, CA; April 2, 2017
133. Orzel, J.; Gross, E.D.; Galloway, K.R.; **Bretz, S.L.** "Faculty Expectations for Meaningful Learning in the Undergraduate Chemistry Laboratory: How Do Students' Experiences Compare?" 253rd American Chemical Society National Meeting, San Francisco, CA; April 2, 2017

RESEARCH POSTERS (*undergraduates & high school teachers underlined*)

132. Allen, G.H.; Luxford, C.J.; **Bretz, S.L.** “Students’ Use of Symbolic and Particulate Representations to Characterize Bonding,” 253rd American Chemical Society National Meeting, San Francisco, CA; April 2, 2017
131. Mercado, J.P.; **Bretz, S.L.**; Danielson, N.D. “Indirect Determination of Zinc by Thiol Complexation and Iodine Coulometric Titration with Photodiode Detection,” Pittcon Conference & Expo, Chicago, IL; March 5, 2017
130. **Bretz, S.L.** “Measuring Chemistry Students’ Understandings of Multiple External Representations through Cluster Analysis,” AAAS & NSF Conference on Envisioning the Future of Undergraduate STEM Education: Research and Practice Symposium, Washington, D.C.; April 28, 2016
129. Orzel, J.; Gross, E.D.; Galloway, K.R.; **Bretz, S.L.** “Faculty Expectations for Cognitive and Affective Learning in the Undergraduate Chemistry Laboratory,” 251st American Chemical Society National Meeting, San Diego, CA; March 13, 2016
128. Popova, M.; **Bretz, S.L.** “Organic Chemistry Students’ Understandings of the Relationship between Stability and Reactivity in the Context of Bonding,” 251st American Chemical Society National Meeting, San Diego, CA; March 13, 2016
127. Abell, T.N.; **Bretz, S.L.** “Student Understanding of Solution Chemistry through the Lenses of Enthalpy and Entropy,” 251st American Chemical Society National Meeting, San Diego, CA; March 13, 2016
126. Allred, Z.R.; **Bretz, S.L.** “Students’ Ideas about Electron Structure with Regards to Probability and Energy Quantization,” 251st American Chemical Society National Meeting, San Diego, CA; March 13, 2016
125. Anzovino, M.E.; **Bretz, S.L.** “Investigating Organic Chemistry Students’ Ideas about Nucleophiles, Electrophiles, and Reaction Mechanisms,” 249th American Chemical Society National Meeting, Denver, CO; March 22, 2015
124. Galloway, K.R.; **Bretz, S.L.** “Analysis of Meaningful Learning in the General Chemistry Laboratory,” 249th American Chemical Society National Meeting, Denver, CO; March 22, 2015
123. Anzovino, M.E.; **Bretz, S.L.** “Exploring Organic Chemistry Students’ Understandings of Reactivity,” 248th American Chemical Society National Meeting, San Francisco, CA; August 2014
122. Galloway, K.R.; **Bretz, S.L.** “Students’ Cognitive and Affective Experiences in the Undergraduate Chemistry Laboratory as Measured by the Meaningful Learning in the Laboratory Inventory,” 248th American Chemical Society National Meeting, San Francisco, CA; August 2014
121. Anzovino, M.E.; **Bretz, S.L.**; Moore, J.W. “Development of the Awareness of and Attitudes toward Scientific Research Inventory (AASRI) and Probing Organic Chemistry Students’ Understanding of Organic Reactivity: Two Distinct Research Projects as a Context for Discussing Methodological Considerations in Chemistry Education Research,” 248th American Chemical Society National Meeting, San Francisco, CA; August 2014
120. Bermúdez Mendez, I.; Brandriet, A.R.; **Bretz, S.L.** “Determining the Effect of Representational Complexity on Student Understanding of Precipitation Reactions,” 247th American Chemical Society National Meeting, Dallas, TX; March 2014
119. Adams, W.; Bermúdez Mendez, I.; Brandriet, A.R.; **Bretz, S.L.** “Investigating Student Understanding of the Symbolic, Macroscopic, and Particulate Domains of Precipitation Reactions,” 247th American Chemical Society National Meeting, Dallas, TX; March 2014
118. Malakpa, Z.; Galloway, K.R.; Towns, M.; **Bretz, S.L.** “In Their Own Words: An Analysis of Students’ Attitudes towards Chemistry Lab,” 247th American Chemical Society National Meeting, Dallas, TX; March 2014
117. Jensen, J.D.; Cooper, M.M.; **Bretz, S.L.** “Students’ Identification of Acids and Bases,” Gordon Research Conference on Chemistry Education Research and Practice, Salve Regina University, June 2013
116. Brandriet, A.R.; **Bretz, S.L.** “Using the Redox Concept Inventory (ROXCI) to Assess Student Misconceptions in the Symbolic and Particulate Domains,” Gordon Research Conference on Chemistry Education Research and Practice, Salve Regina University, June 2013
115. Galloway, K.R.; Towns, M.H.; **Bretz, S.L.** “Developing an Instrument to Measure Meaningful Learning in the Undergraduate Chemistry Laboratory,” Gordon Research Conference on Chemistry Education Research and Practice, Salve Regina University, June 2013
114. Jensen, J.D.; **Bretz, S.L.** “Measuring Student Understanding of Acid-Base Reactions using the Acid-Base Concept Inventory,” CREATE4STEM Conference, Michigan State University, May 7, 2013
113. Galloway, K.R.; Owings, T.; Towns, M.H.; **Bretz, S.L.** “Developing an Instrument to Measure Meaningful Learning in the Undergraduate Chemistry Laboratory,” 245th American Chemical Society National Meeting, New Orleans, LA, April 7, 2013
112. Galloway, K.R.; Owings, T.; Towns, M.H.; **Bretz, S.L.** “Student Goals for Undergraduate Laboratory,” 245th American Chemical Society National Meeting, New Orleans, LA, April 7, 2013
111. Malakpa, Z.; Jensen, J.D.; **Bretz, S.L.** “Investigating Student Anxiety within the Chemistry Laboratory,” 245th American Chemical Society National Meeting, New Orleans, LA, April 7, 2013
110. Jensen, J.D.; **Bretz, S.L.** “Measuring Student Understanding of Acid-Base Reactions using the Acid-Base Concept Inventory,” 245th American Chemical Society National Meeting, New Orleans, LA, April 7, 2013
109. Luxford, C.J.; **Bretz, S.L.** “Students’ Understanding of Bonding as Measured by the Bonding Representations Inventory,” 245th American Chemical Society National Meeting, New Orleans, LA, April 7, 2013

RESEARCH POSTERS (*undergraduates & high school teachers underlined*)

108. Brandriet, A.R.; **Bretz, S.L.** "Using the Redox Concept Inventory to Assess Student Misconceptions in the Symbolic and Particulate Domains," 245th American Chemical Society National Meeting, New Orleans, LA, April 7, 2013
107. Bindis, M.P.; **Bretz, S.L.** "Analysis of Student Performance on the Molecular Attractions Concept Inventory," 245th American Chemical Society National Meeting, New Orleans, LA, April 7, 2013
106. **Bretz, S.L.** "Chemistry Concept Inventories: Best Practices in Assessment Design," NSF-DR K-12 PI Meeting, Washington, D.C., June 13, 2012
105. **Bretz, S.L.** "Chemistry Concept Inventories: Best Practices in Assessment Design," Transforming Research in Undergraduate STEM Education Conference, University of St. Thomas, St. Paul, MN, June 6, 2012
104. McClary, L.M.; **Bretz, S.L.** "ACID I: A Diagnostic Tool to Assess Organic Chemistry Students' Conceptions of Acid Strength," Transforming Research in Undergraduate STEM Education Conference, June 6, 2012
103. Linenberger, K.J.; **Bretz, S.L.** "Misconceptions as Measured by the Enzyme-Substrate Interactions Concept Inventory," 243rd American Chemical Society National Meeting, San Diego, CA, March 27, 2012
102. Nielsen, S.; Galloway, K.R.; Yezierski, E.J.; **Bretz, S.L.** "Best Practices in Concept Inventory Design," 243rd American Chemical Society National Meeting, San Diego, CA, March 27, 2012
101. Brandriet, A.R.; **Bretz, S.L.** "Student Conceptions about Oxidation-Reduction Reactions across the Particulate, Macroscopic, and Symbolic Domains," 243rd American Chemical Society National Meeting, San Diego, CA, March 27, 2012
100. McClary, L.M.; **Bretz, S.L.** "ACID I: A Diagnostic Tool to Assess Organic Chemistry Students' Conceptions of Acid Strength," 243rd American Chemical Society National Meeting, San Diego, CA, March 27, 2012
99. Luxford, C.J.; **Bretz, S.L.** "Multiple representations of covalent and ionic bonding: Development of a concept inventory," 243rd American Chemical Society National Meeting, San Diego, CA, March 27, 2012
98. Jensen, J.D.; **Bretz, S.L.** "Student Misconceptions as Measured by the Acid-Base Reaction Concept Inventory," 243rd American Chemical Society National Meeting, San Diego, CA, March 27, 2012
97. Murata, A.V.; **Bretz, S.L.** "Atomic Emission and Flame Test Concept Inventory" 243rd American Chemical Society National Meeting, San Diego, CA, March 27, 2012
96. Bindis, M.P.; **Bretz, S.L.** "Intermolecular Forces Concept Inventory: A Pilot Study," 243rd American Chemical Society National Meeting, San Diego, CA, March 27, 2012
95. **Bretz, S.L.** "Measuring What Students Know: Misconceptions and Concept Inventories in Chemistry," Transforming Education: From Innovation to Implementation Conference, Purdue University, October 11, 2011
94. Brandriet, A.R.; **Bretz, S.L.** "Student Knowledge of Oxidation-Reduction Reactions across the Particulate, Macroscopic, and Symbolic Domains of Chemistry," Gordon Research Conference on Chemistry Education Research and Practice, June 2011
93. Luxford, C.J.; **Bretz, S.L.** "Using Multiple Representations to Reveal Students' Ideas about Bonding," Gordon Research Conference on Chemistry Education Research and Practice, June 2011
92. Linenberger, K.J.; **Bretz, S.L.** "Misconceptions Uncovered by the Enzyme-Substrate Concept Inventory," Gordon Research Conference on Chemistry Education Research and Practice, June 2011
91. Murata, A.V.; **Bretz, S.L.** "From Flame Tests to Energy Level Diagrams: Student Understanding of Atomic Emission," Gordon Research Conference on Chemistry Education Research and Practice, June 2011
90. McClary, L.M.; **Bretz, S.L.** "Psychometric Analyses of an ACID Concept Inventory," Gordon Research Conference on Chemistry Education Research and Practice, June 2011
89. Brandriet, A.R.; **Bretz, S.L.** "Student Knowledge of Oxidation-Reduction Reactions across the Particulate, Macroscopic, and Symbolic Domains of Chemistry," NSF Chemistry Education Research Graduate Student Conference, June 11, 2011
88. Luxford, C.J.; **Bretz, S.L.** "Using Multiple Representations to Reveal Students' Ideas about Bonding," NSF Chemistry Education Research Graduate Student Conference, June 11, 2011
87. Linenberger, K.J.; **Bretz, S.L.** "Misconceptions Uncovered by the Enzyme-Substrate Concept Inventory," NSF Chemistry Education Research Graduate Student Conference, June 11, 2011
86. Murata, A.V.; **Bretz, S.L.** "From Flame Tests to Energy Level Diagrams: Student Understanding of Atomic Emission," NSF Chemistry Education Research Graduate Student Conference, June 11, 2011
85. McClary, L.M.; **Bretz, S.L.** "Psychometric Analyses of an ACID Concept Inventory," NSF Chemistry Education Research Graduate Student Conference, June 11, 2011
84. Bindis, M.P.; **Bretz, S.L.** "Student Misconceptions of Intermolecular Forces as Revealed through Paper Chromatography Experiments," NSF Chemistry Education Research Graduate Student Conference, June 11, 2011
83. Jensen, J.D.; **Bretz, S.L.** "Misconceptions about Acid-Base Reactions," NSF Chemistry Education Research Graduate Student Conference, June 11, 2011
82. Linenberger, K.J.; **Bretz, S.L.** "Biochemistry Students' Understandings of Enzyme-Substrate Interactions," 30th Anniversary Chemical Education Conference, Purdue University, April 16, 2011
81. Linenberger, K.J.; **Bretz, S.L.** "Biochemistry Students' Understandings of Enzyme-Substrate Interactions," 2011 American Society of Biochemistry and Molecular Biology Annual Meeting, Washington, DC, April 12, 2011

RESEARCH POSTERS (*undergraduates & high school teachers underlined*)

80. Gephart, J.A.; Emenike, M.E.; **Bretz, S.L.** "From Chemical-Free to Green, Organic, and Natural: Measuring Greenness in Cleaning Products and Food Print Ads," 241st American Chemical Society National Meeting, Anaheim, CA, March 28, 2011
79. Brandriet, A.R.; **Bretz, S.L.** "Student Knowledge of Oxidation-Reduction Reactions across the Particulate, Macroscopic, and Symbolic Domains," 241st American Chemical Society National Meeting, Anaheim, CA, March 27, 2011
78. Towns, M.H.; **Bretz, S.L.** "Inquiry in the Undergraduate Chemistry Laboratory: Faculty Goals and Perspectives," NSF CCLI PI Meeting, January 27, 2011
77. Holme, T.A.; **Bretz, S.L.**; Stacy, A.M.; Cooper, M.M.; Lewis, J.E.; Towns, M.H. "A Model for Data-driven Reform in Chemistry Education," NSF CCLI PI Meeting, January 27, 2011
76. O'Donnell, M.E.; **Bretz, S.L.** "What Makes Something a Chemical? Investigating Fourth-Grade Children's Ideas about Chemicals and their Properties," Transforming Research in Undergraduate STEM Education (TRUSE), University of Maine, June 15, 2010
75. Gephart, J.A.; Emenike, M.E.; **Bretz, S.L.** "From Chemical-Free to Green, Organic, and Natural: Measuring Greenness in Cleaning Products and Food Print Ads," 239th American Chemical Society National Meeting, San Francisco, CA, March 22, 2010
74. Bruck, A.; Towns, M.H.; **Bretz, S.L.** "Faculty Perspectives of the Undergraduate Laboratory: A Quantitative Survey-Based Approach," 239th American Chemical Society National Meeting, San Francisco, CA, March 21, 2010
73. Luxford, C.J.; Crowder, M.W.; **Bretz, S.L.** "Creating an Inorganic POGIL Symmetry Activity," 239th American Chemical Society National Meeting, San Francisco, CA, March 21, 2010
72. Murata, A.V.; Loegel, T.; **Bretz, S.L.**; Danielson, N.D. "Design and Characterization of a Flow Injection/Liquid Chromatography Instrument Using a Student Laboratory Network," 239th American Chemical Society National Meeting, San Francisco, CA, March 21, 2010
71. Jensen, J.D.; Grundy, S.; **Bretz, S.L.**; Hartley, C.S. "Can You Design the Next i-Pod? Liquid Crystal Synthesis in the Undergraduate Laboratory," 239th American Chemical Society National Meeting, San Francisco, CA, March 21, 2010
70. Bindis, M.P.; **Bretz, S.L.**; Danielson, N.D. "Implementation of a Novel HPLC Experiment in an Undergraduate Analytical Laboratory Course," 239th American Chemical Society National Meeting, San Francisco, CA, March 21, 2010
69. Bindis, M.P.; **Bretz, S.L.**; Danielson, N.D. "Use of Polymeric Monolithic HPLC Columns in an Undergraduate Analytical Chemistry Laboratory," PITTCON 2010, Orlando, FL, March 4, 2010
68. **Bretz, S.L.** "Chemistry Education Research Doctoral Fellows Program," NSF-DRK-12 PI Conference, Washington, D.C., November 9, 2009
67. Linenberger, K.J.; **Bretz, S.L.** "Representational Competence in Student Understandings of Enzyme Catalysis," Gordon Research Conference on Visualization in Science Education, Oxford College, England, July 26, 2009
66. Linenberger, K.J.; **Bretz, S.L.** "Methodological Musings about Using Multiple Representations to Probe Student Misconceptions of Enzyme Catalysis," Gordon Research Conference on Chemistry Education Research and Practice, June 24, 2009
65. O'Donnell, M.E.; **Bretz, S.L.** "Investigating Children's Ideas about Chemicals," Gordon Research Conference on Chemistry Education Research and Practice, June 24, 2009
64. **Bretz, S.L.** "Chemistry Education Research Doctoral Fellows Program," Gordon Research Conference on Chemistry Education Research and Practice, June 23, 2009
63. Sanabria-Rios, D.; **Bretz, S.L.** "Study of the Relationship between Faculty's Cognitive Expectations about Learning Chemistry and the Construction of Exam Questions," Gordon Research Conference on Chemistry Education Research and Practice, June 23, 2009
62. Sanabria-Rios, D.; **Bretz, S.L.** "Is There Any Relationship between Faculty Expectations about Learning Chemistry and the Construction of Exam Questions?" NSF Chemistry Education Research Graduate Student Conference, June 6, 2009
61. Warren, A.; **Bretz, S.L.** "Using Analogies to Elicit Biochemistry Misconceptions," NSF Chemistry Education Research Graduate Student Conference, June 6, 2009
60. Luxford, C.J.; **Bretz, S.L.** "Misconceptions about Lewis Dot Structures – Beyond the Octet Rule," NSF Chemistry Education Research Graduate Student Conference, June 6, 2009
59. Jensen, J.D.; **Bretz, S.L.** "Misconceptions about Acid-Base Reactions," NSF Chemistry Education Research Graduate Student Conference, June 6, 2009
58. Bindis, M.P.; **Bretz, S.L.** "Misconceptions about Intermolecular Forces in Chromatography," NSF Chemistry Education Research Graduate Student Conference, June 6, 2009
57. Vasquez, A.M.; **Bretz, S.L.** "Misconceptions about UV-Vis Energy Diagrams," NSF Chemistry Education Research Graduate Student Conference, June 6, 2009

RESEARCH POSTERS (*undergraduates & high school teachers underlined*)

56. Linenberger, K.J.; **Bretz, S.L.** "Methodological Musings about Using Multiple Representations to Probe Student Misconceptions of Enzyme Catalysis," NSF Chemistry Education Research Graduate Student Conference, June 6, 2009
55. O'Donnell, M.E.; **Bretz, S.L.** "Investigating Children's Ideas about Chemicals," NSF Chemistry Education Research Graduate Student Conference, June 6, 2009
54. Bindis, M.P.; Jensen, J.D.; Jackson, L.; Luxford, C.J.; Vasquez, A.; Warren, A.; **Bretz, S.L.** "Chemistry Education Research Doctoral Fellows Program," 237th American Chemical Society National Meeting, Salt Lake City, UT, March 22, 2009
53. O'Donnell, M.E.; **Bretz, S.L.** "Children's Ideas about Chemicals," 237th American Chemical Society National Meeting, Salt Lake City, UT, March 22, 2009
52. Linenberger, K.J.; Emwas, A.-H.; Peat, I.; McCarrick, R.; Lorigan, G.A.; Crowder, M.W.; **Bretz, S.L.** "Integrated Paramagnetic Resonance Spectroscopy and the Heme Center of Met-Myoglobin: A Collaborative Research Project for an Upper Level Undergraduate Laboratory," 237th American Chemical Society National Meeting, Salt Lake City, UT, March 22, 2009
51. Sanabria-Ríos, D.; **Bretz, S.L.** "QUIMX: An Instrument for Assessing Cognitive Expectations for Learning Chemistry among Hispanic Populations," 237th American Chemical Society National Meeting, Salt Lake City, UT, March 22, 2009
50. Bullinger, L.; O'Donnell, M.E.; **Bretz, S.L.** "Investigating First Year Chemistry Major Students' Ideas about Chemicals," 237th American Chemical Society National Meeting, Salt Lake City, UT, March 23, 2009
49. Gephart, J.A.; O'Donnell, M.E.; **Bretz, S.L.** "From Chemophobia to Green Chemistry: An Analysis of Marketing Claims in *National Geographic Green Guide*," 237th American Chemical Society National Meeting, Salt Lake City, UT, March 23, 2009
48. **Bretz, S.L.** "Chemistry Education Research Doctoral Fellows Program," NSF-DRK-12 PI Conference, Washington, D.C., November 13, 2008
47. **Bretz, S.L.** "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," NSF CCLI Conference, Washington D.C., August 14, 2008
46. **Bretz, S.L.** "Characterizing the Level of Inquiry in the Undergraduate Laboratory," NSF CCLI Conference, Washington D.C., August 14, 2008
45. **Bretz, S.L.** "Characterizing the Level of Inquiry in the Undergraduate Laboratory," 20th Biennial Conference on Chemical Education, Indiana University, July 2008
44. Grove, N.P.; Hershberger, J.; **Bretz, S.L.** "Impact of Spiral Organic Curriculum on Student Attrition and Learning," 235th American Chemical Society National Meeting, New Orleans, LA, April 6, 2008
43. Nafziger, K.; **Bretz, S.L.** "Particulate Nature of Matter, Self-Efficacy, and Pedagogical Content Knowledge: Case Studies in Inquiry," 235th American Chemical Society National Meeting, New Orleans, LA, April 6, 2008
42. Fay, M.E.; **Bretz, S.L.** "Mapping the Dimensions of the Undergraduate Chemistry Laboratory: Faculty Perspectives on Curriculum, Pedagogy, and Assessment," Gordon Research Conference on Chemistry Education Research and Practice, June 27, 2007
41. Grove, N.P.; **Bretz, S.L.** "Change in Structure: Understanding Student Attrition in a Spiral Organic Chemistry Curriculum," Gordon Research Conference on Chemistry Education Research and Practice, June 26, 2007
40. Mathew, J.; Grove, N.P.; **Bretz, S.L.** "Online data collection and database development for survey research in chemistry education," 233rd American Chemical Society National Meeting, Chicago, IL, March 27, 2007
39. Nafziger, K.; Motter, B.; **Bretz, S.L.** "Connecting Science and Literacy: Hands-on Inquiry in the Elementary Classroom," 233rd American Chemical Society National Meeting, Chicago, IL, March 27, 2007
38. Grove, N.P.; Hershberger, J.; **Bretz, S.L.** "Change in structure: Understanding student attrition in a spiral organic chemistry curriculum," 233rd American Chemical Society National Meeting, Chicago, IL, March 26, 2007
37. Fay, M.E.; **Bretz, S.L.** "Mapping the Dimensions of the Undergraduate Chemistry Laboratory: Faculty Perspectives on Curriculum, Pedagogy, and Assessment," 233rd American Chemical Society National Meeting, Chicago, IL, March 26, 2007
36. Grove, N.P.; **Bretz, S.L.** "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," International Society for Scholarship of Teaching and Learning, Washington, DC, November 10, 2006
35. Grove, N.P.; **Bretz, S.L.** "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," National Science Foundation Conference on Assessment, Washington, DC, October 20, 2006
34. Nafziger, K.; Motter, B.; **Bretz, S.L.** "Connecting Science and Literacy: Hands-on Inquiry in the Elementary Classroom," 19th Biennial Conference on Chemical Education, Purdue University, July 31, 2006
33. Fay, M.E.; **Bretz, S.L.** "Mapping the Dimensions of the Undergraduate Chemistry Laboratory: Faculty Perspectives on Curriculum, Pedagogy, and Assessment," 19th Biennial Conference on Chemical Education, Purdue University, July 31, 2006
32. Mathew, J.; Grove, N.P.; **Bretz, S.L.** "Online data collection and database development for survey research in chemistry education," 19th Biennial Conference on Chemical Education, Purdue University, July 31, 2006
31. Mathew, J.; Grove, N.P.; **Bretz, S.L.** "Online data collection and database development for survey research in chemistry education," 231st American Chemical Society National Meeting, Atlanta, GA, March 27, 2006

RESEARCH POSTERS (*undergraduates & high school teachers underlined*)

30. Grove, N.P.; **Bretz, S.L.** "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," Gordon Research Conference on Chemistry Education Research and Practice, June 27, 2005
29. Grove, N.P.; **Bretz, S.L.** "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," 229th American Chemical Society National Meeting, San Diego, CA, March 14, 2005
28. Smith, K.C.; Nakhleh, M.B.; **Bretz, S.L.** "Professional Development of Teachers as Researchers: Integrating Pedagogy and Content through Research in Chemistry Education," U.S. Department of Education, FIPSE Project Directors' Meeting, Washington, DC; November 4, 2004
27. Grove, N.P.; **Bretz, S.L.** "CHEMX: Assessing Cognitive Expectations for Learning Chemistry," International Society for Scholarship of Teaching and Learning, Bloomington, IN, October 23, 2004
26. DeBernardo, H.; **Bretz, S.L.** "The State of Matter: Meeting the National Standards," 18th Biennial Conference on Chemical Education, Iowa State University, July 2004
25. Lucarielli, C.; **Bretz, S.L.** "Unwinding the Genetic Code: Learning through Inquiry," 18th Biennial Conference on Chemical Education, Iowa State University, July 2004
24. Snyder, W.; **Bretz, S.L.** "Molecular Geometry & Properties: Meeting the National Science Standards," 18th Biennial Conference on Chemical Education, Iowa State University, July 2004
23. Smith, K.C.; Nakhleh, M.B.; **Bretz, S.L.** "Analysis of the ACS Blended General Chemistry Exams Using a New Coding Framework," 227th American Chemical Society National Meeting, Anaheim, CA, March 28, 2004
22. Grove, N.P.; **Bretz, S.L.** "Differences in Expectations between Teachers and Learners of University Chemistry," 227th American Chemical Society National Meeting, Anaheim, CA, March 28, 2004
21. Hutchinson, K.; Mettee, H.; **Bretz, S.L.**; Smiley, J. "Acid and Temperature Dependence of Pyrrole-2-Carboxylate Decarboxylation and Integration into the Physical Chemistry Laboratory," 227th American Chemical Society National Meeting, Anaheim, CA, March 28, 2004
20. Smith, K.C.; Nakhleh, M.B.; **Bretz, S.L.** "Analysis of the ACS Blended General chemistry Exams Using a New Coding Framework," 227th American Chemical Society National Meeting, Anaheim, CA, March 28, 2004
19. **Bretz, S.L.** "Professional Development of Teachers as Researchers: Integrating Pedagogy and Content through Research in Chemistry Education," 227th American Chemical Society National Meeting, Anaheim, CA, March 28, 2004
18. Smith, K.C.; Nakhleh, M.B.; **Bretz, S.L.** "Professional Development of Teachers as Researchers: Integrating Pedagogy and Content through Research in Chemistry Education," U.S. Department of Education, FIPSE Project Directors' Meeting, Denver, CO; December 2, 2003
17. **Bretz, S.L.** "Professional Development for High School Chemistry Teachers: Integrating Pedagogy and Content through Teacher Research," American Chemical Society Central Regional Meeting, Pittsburgh, PA; October 21, 2003
16. Grove, N.P.; **Bretz, S.L.** "Differences in Expectations between Teachers and Learners of University Chemistry," American Chemical Society Central Regional Meeting, Pittsburgh, PA; October 20, 2003
15. DeBernardo, H.; **Bretz, S.L.** "The State of Matter: Meeting the National Standards," American Chemical Society Central Regional Meeting, Pittsburgh, PA; October 21, 2003
14. McSparrin, L.; **Bretz, S.L.** "A Portfolio of Guided Inquiry Activities to Address National Science Education Standards Related to the Quantum Theory," American Chemical Society Central Regional Meeting, Pittsburgh, PA; October 21, 2003
13. Lucarielli, C.; **Bretz, S.L.** "Unwinding the Genetic Code: Learning through Inquiry," American Chemical Society Central Regional Meeting, Pittsburgh, PA; October 21, 2003
12. Snyder, W.; **Bretz, S.L.** "Molecular Geometry & Properties: Meeting the National Science Standards," American Chemical Society Central Regional Meeting, Pittsburgh, PA; October 21, 2003
11. Grove, N.P.; **Bretz, S.L.** "Differences in Expectation between Teachers and Learners of University Chemistry," Duquesne University, Research Experiences for Undergraduates Symposium," Pittsburgh, PA, July 23, 2003
10. Hutchinson, K.; Mettee, H.; **Bretz, S.L.**; Smiley, J. "Acid and Temperature Dependence of Pyrrole-2-Carboxylate Decarboxylation and Integration into the Physical Chemistry Laboratory," Duquesne University, Research Experiences for Undergraduates Symposium," Pittsburgh, PA, July 23, 2003
9. **Bretz, S.L.** "Professional Development for High School Chemistry Teachers: An Innovative Degree in Chemistry Education Research," 225th American Chemical Society National Meeting, New Orleans, LA, March 23, 2003
8. **Bretz, S.L.** "Professional Development for High School Chemistry Teachers: Integrating Pedagogy and Content through Action Research," U.S. Department of Education FIPSE Project Directors' Meeting, November 22, 2002
7. **Bretz, S.L.** "Professional Development for High School Chemistry Teachers: An Innovative M.S. Degree in Chemistry Education," 224th American Chemical Society National Meeting, Boston, MA, August 18, 2002
6. **Bretz, S.L.** "Professional Development for High School Chemistry Teachers: Integrating Pedagogy and Content through Action Research," 17th Biennial Conference on Chemical Education, Western Washington University, July 31, 2002
5. Hohloch, J.; **Bretz, S.L.** "Collaborative Investigations for Learning Chemistry: Pre-Service Teachers and Learning through Inquiry," Northeast Ohio Title II Regional Conference on Teacher Quality, University of Akron, April 27, 2002

RESEARCH POSTERS (*undergraduates & high school teachers underlined*)

4. **Bretz, S.L.** "Professional Development for High School Chemistry Teachers: An Innovative M.S. Degree in Chemistry Education," 223rd American Chemical Society National Meeting, Orlando, FL, April 7, 2002
3. Kim, T.D.; **Bretz, S.L.** "Why an M.S. in Chemistry?" 222nd American Chemical Society National Meeting, Chicago, IL, August 25, 2001
2. **Bretz, S.L.** "M.S. in Chemistry with Chemistry Education Specialization," 221st American Chemical Society National Meeting, San Diego, CA, April 2, 2001.
1. Jardine, R.; **Bretz, S.L.** "Assessing Learning Strategies in General Chemistry," University of Michigan-Dearborn Department of Natural Sciences Poster Session, April 6, 1999

CONTRIBUTED PAPERS (*undergraduates & high school teachers underlined*)

109. Croisant, M.F.; **Bretz, S.L.**; Konkolewicz, D. "Investigating Radical Reactivity and Structure-Property Relationships with Photochemically-Synthesized Polymers," Biennial Conference on Chemical Education, University of Notre Dame, August 2, 2018
108. Allred, Z.R.; **Bretz, S.L.** "Investigating General Chemistry and Physical Chemistry Students' Probabilistic Reasoning about the Electronic Structure of the Atom," Biennial Conference on Chemical Education, University of Notre Dame, August 1, 2018
107. Abell, T.N.; **Bretz, S.L.** "Students' Reasoning about Representations related to Dissolving and Precipitation," Biennial Conference on Chemical Education, University of Notre Dame, August 1, 2018
106. Allred, Z.R.; **Bretz, S.L.** "Measuring General Chemistry and Physical Chemistry Students' Ideas about the Electronic Structure of the Atom: The Quantization and Probability Representations Inventory," Biennial Conference on Chemical Education, University of Notre Dame, August 1, 2018
105. Popova, M.; **Bretz, S.L.** "It's only the Major Product that We Care about in Organic Chemistry: An Analysis of Students' Annotations of Reaction Coordinate Diagrams," Biennial Conference on Chemical Education, University of Notre Dame, August 1, 2018
104. Croisant, M.F.; **Bretz, S.L.** "Investigating Students' Conceptions of Chemical Kinetics and Reaction Coordinate Diagrams," Biennial Conference on Chemical Education, University of Notre Dame, August 1, 2018
103. Popova, M.; **Bretz, S.L.** "Organic Chemistry Students' Interpretations of the Surface Features of Reaction Coordinate Diagrams," Biennial Conference on Chemical Education, University of Notre Dame, July 31, 2018
102. Abell, T.N.; **Bretz, S.L.** "Students' Understandings of Spontaneity and Entropy in the Contexts of Dissolving and Precipitation," Biennial Conference on Chemical Education, University of Notre Dame, July 31, 2018
101. Roche Allred, Z.; **Bretz, S.L.** "Assessment of Students' Understandings of Quantization and Probability using Representations of the Electronic Structure of the Atom," 101st Canadian Chemistry Conference and Exhibition, Edmonton, Alberta; May 30, 2018
100. Abell, T.N.; **Bretz, S.L.** "Assessment of Students' Understandings of Enthalpy and Entropy Changes in the Context of Dissolving and Precipitation," 101st Canadian Chemistry Conference and Exhibition, Edmonton, Alberta; May 30, 2018
99. Yeziarski, E.J.; **Bretz, S.L.** "Discovery and Concept Development in Large General Chemistry Lecture Courses: How In-Class Simulation Activities Can Translate Research on Inquiry, Multimedia, and Representations to Practice," 252nd American Chemical Society National Meeting, Washington, DC; August 2017
98. Galloway, K.R.; **Bretz, S.L.** "Designing a National, Cross-Sectional Study to Measure Meaningful Learning in the Undergraduate Chemistry Laboratory," Biennial Conference on Chemical Education, University of Northern Colorado, August 2016
97. Allred, Z.R.; **Bretz, S.L.** "General and Physical Chemistry Students' Ideas about Electron Structure," Biennial Conference on Chemical Education, University of Northern Colorado, August 2016
96. Allred, Z.R.; Tai, H.; **Bretz, S.L.**; Page, R.C. "Using PyMOL to Explore the Effects of pH on Non-Covalent Interactions between Immunoglobulin G and Protein A: A Guided-Inquiry Biochemistry Activity," Biennial Conference on Chemical Education, University of Northern Colorado, August 2016
95. Popova, M.; **Bretz, S.L.** "Organic Chemistry Students' Understandings of the Relationship between Stability and Reactivity in the Context of Bonding," Biennial Conference on Chemical Education, University of Northern Colorado, August 2016
94. Popova, M.; **Bretz, S.L.**; Hartley, C.S. "Visualizing Molecular Chirality in the Organic Chemistry Laboratory using Cholesteric Liquid Crystals," Biennial Conference on Chemical Education, University of Northern Colorado, August 2016
93. Abell, T.N.; **Bretz, S.L.** "Investigating Student Understanding of Solution Chemistry through the Lenses of Enthalpy and Entropy," Biennial Conference on Chemical Education, University of Northern Colorado, August, 2016
92. Abell, T.N.; McCarrick, R.; **Bretz, S.L.**; Tierney, D. "Trispyrazolylborate Complexes: An Advanced Synthesis Experiment using Paramagnetic NMR, Variable Temperature NMR, and EPR Spectroscopies," Biennial Conference on Chemical Education, University of Northern Colorado, August, 2016
91. **Bretz, S.L.** "CER Synergy at Miami University: Building Simultaneous Expertise in Chemistry and Education Research," 251st American Chemical Society National Meeting, San Diego, CA; March 13, 2016

CONTRIBUTED PAPERS (*undergraduates & high school teachers underlined*)

90. Anzovino, M.E.; **Bretz, S.L.** "An Analysis of First- and Second-Semester Organic Chemistry Students' Examples of Nucleophiles and Electrophiles," 251st American Chemical Society National Meeting, San Diego, CA; March 13, 2016
89. Galloway, K.R.; **Bretz, S.L.** "A Longitudinal Study to Measure Students' Meaningful Learning in the Undergraduate Chemistry Laboratory," 251st American Chemical Society National Meeting, San Diego, CA; March 13, 2016
88. Popova, M.; **Bretz, S.L.**; Hartley, C.S. "Liquid Crystals as a Tool to Investigate Chirality in the Organic Teaching Laboratory," Chirality at the Nanoscale Symposium, Kent State University Liquid Crystal Institute, Kent, OH, June 4, 2015
87. Luxford, C.J.; **Bretz, S.L.** "Measuring Students' Ideas about Covalent and Ionic Bonding with the Bonding Representations Inventory: Insights from Models and the Dangers of Definitions," 248th American Chemical Society National Meeting, San Francisco, CA; August 11, 2014
86. Owings, T.; Towns, M.H.; **Bretz, S.L.** "Students' Expected and Achieved Goals for the Undergraduate Chemistry Laboratory," Biennial Conference on Chemical Education, Grand Valley State University, August 4, 2014
85. Malakpa, Z.; Galloway, K.R.; **Bretz, S.L.** "Measuring Affective Learning in the Undergraduate Chemistry Laboratory," Biennial Conference on Chemical Education, Grand Valley State University, August 6, 2014
84. Owings, T.; DeKorver, B.; Towns, M.H.; **Bretz, S.L.** "Faculty and Student Goals for the Undergraduate Chemistry Laboratory," International Conference on Chemistry Education, Toronto, Canada; July 17, 2014
83. Galloway, K.R.; **Bretz, S.L.** "Exploring Students' Cognitive and Affective Experiences through Self-Narrated Episodes in the Undergraduate Chemistry Laboratory," International Conference on Chemistry Education, Toronto, Canada; July 14, 2014
82. Anzovino, M.E.; **Bretz, S.L.** "Using Multiple Representations of Nucleophiles and Electrophiles to Explore Organic Chemistry Students' Understandings of Reactivity," International Conference on Chemistry Education, Toronto, Canada; July 17, 2014
81. Brandriet, A.; **Bretz, S.L.** "Analysis of the Redox Concept Inventory (ROXCI) as a Measure of Student Understanding and Confidence about Symbolic and Particulate Redox Models," 247th American Chemical Society National Meeting, Dallas, TX; March 2014
80. Galloway, K.R.; Towns, M.H.; **Bretz, S.L.** "Using Video Episodes to Elicit Student Perceptions of Meaningful Learning in the Undergraduate Chemistry Laboratory," 247th American Chemical Society National Meeting, Dallas, TX; March 2014
79. **Bretz, S.L.** "Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering," 2013 Lilly International Conference on College Teaching, Miami University, Oxford, OH; November 2013
78. **Bretz, S.L.** "Measuring Student Understanding of Multiple Representations in Chemistry," 4th Realistic Mathematics Education Conference, University of Colorado, Boulder, CO, September 27, 2013.
77. Galloway, K.R.; Towns, M.H.; **Bretz, S.L.** "MLILI: Assessment of Meaningful Learning in the Undergraduate Chemistry Laboratory," NSF Chemistry Education Research Graduate Student Conference, July 26, 2013
76. Brandriet, A.; **Bretz, S.L.** "Analysis of the Redox Concept Inventory (ROXCI) as a Measure of Student Understanding of Particulate and Symbolic Oxidation-Reduction Concepts," NSF Chemistry Education Research Graduate Student Conference, July 26, 2013
75. Brandriet, A.; Greenbowe, T.; Burke, K.; Gelder, J.; Abraham, M.; **Bretz, S.L.** "Student Understanding of Oxidation-Reduction Processes in Electrochemical Cells," 246th American Chemical Society National Meeting, Indianapolis, IN; September, 2013
74. Luxford, C.J.; **Bretz, S.L.** "Measuring students' understandings of covalent and ionic bonding representations with the Bonding Representations Inventory (BRI)," 246th American Chemical Society National Meeting, Indianapolis, IN; September, 2013
73. Owings, T.; Towns, M.H.; **Bretz, S.L.** "Students' Expected and Achieved Goals for the Undergraduate Chemistry Laboratory," 246th American Chemical Society National Meeting, Indianapolis, IN; September, 2013
72. Harshman, J.; Yeziarski, E.J.; **Bretz, S.L.** "Practical, Implementable Suggestions and Considerations for Undergraduate Chemistry Instructors in their Task of Accommodating Blind Students," ISLAND Conference (Independent Science: Learning in a New Direction), Purdue University, November 2012
71. Galloway, K.R.; Novak, M.; **Bretz, S.L.** "Using a Single Food Source for a Series of Experiments: Anthocyanins in the Organic Teaching Laboratory," 22nd Biennial Conference on Chemical Education, University Park, PA, August 2012
70. Harshman, J.; Yeziarski, E.J.; **Bretz, S.L.** "Seeing Chemistry through the Eyes of the Blind: A Case Study Following One Blind Student through the Math and Concepts of Gas Laws," 22nd Biennial Conference on Chemical Education, University Park, PA, August 2012
69. Towns, M.H.; **Bretz, S.L.** "Faculty Goals for Undergraduate Chemistry Laboratory," 22nd Biennial Conference on Chemical Education, University Park, PA, August 2012

CONTRIBUTED PAPERS (*undergraduates & high school teachers underlined*)

68. Linenberger, K.; **Bretz, S.L.** "Biochemistry Students' Misconceptions as Measured by the Enzyme-Substrate Interactions Concept Inventory," 22nd Biennial Conference on Chemical Education, University Park, PA, August 2012
67. Luxford, C.J.; **Bretz, S.L.** "Student Understanding of Bonding as Measured by the Bonding Representations Inventory," 22nd Biennial Conference on Chemical Education, University Park, PA, August 2012
66. Brandriet, A.R.; **Bretz, S.L.** "Student Understanding of the Particulate Nature of Oxidation-Reduction Reactions," 22nd Biennial Conference on Chemical Education, University Park, PA, August 2012
65. Jensen, J.D.; **Bretz, S.L.** "Measuring Student Understanding of Acid-Base Reactions: Preliminary Results from the Acid-Base Concept Inventory," 22nd Biennial Conference on Chemical Education, University Park, PA, August 2012
64. Murata, A.V.; **Bretz, S.L.** "Student Knowledge of Atomic Emission as measured by the Flame Test Concept Inventory," 22nd Biennial Conference on Chemical Education, University Park, PA, August 2012
63. Towns, M.H.; **Bretz, S.L.** "Faculty Goals for Undergraduate Chemistry Laboratory," 22nd International Conference on Chemical Education, Rome, Italy, July 2012
62. Towns, M.H.; **Bretz, S.L.** "Laboratory Goals in Undergraduate Chemistry," National Science Teachers Association National Meeting, Indianapolis, IN, March 31, 2012
61. **Bretz, S.L.** "Chemistry Misconceptions, Concept Inventories, and Measuring Student Learning," National Science Teachers Association National Meeting, Indianapolis, IN, March 29, 2012
60. Linenberger, K.; **Bretz, S.L.** "Findings from the Enzyme-Substrate Concept Inventory," ACS 2011 Central Regional Meeting, Indianapolis, IN, June 8, 2011
59. McClary, L.M.; **Bretz, S.L.** "Development and Assessment of ACID I Concept Inventory," ACS 2011 Central Regional Meeting, Indianapolis, IN, June 8, 2011
58. Jensen, J.D.; **Bretz, S.L.** "Misconceptions about Acid-Base Reactions," 241st American Chemical Society National Meeting, Anaheim, CA, March 2011
57. Bindis, M.P.; **Bretz, S.L.** "Misconceptions of Intermolecular Forces as Revealed through Paper Chromatography Experiments," 241st American Chemical Society National Meeting, Anaheim, CA, March 2011
56. McClary, L.M.; Bretz, R.L.; Tolbert, B.; Makaroff, C.; **Bretz, S.L.** "Diversity in Chemistry: Research, Programs, and Interventions," 241st American Chemical Society National Meeting, Anaheim, CA, March 2011
55. Emenike, M.; Danielson, N.D.; **Bretz, S.L.** "Meaningful Learning in a First-Year Analytical Chemistry Course: A Qualitative Investigation of Students' Perceptions of Learning across Classical, Discovery, and Instrumental Experiments," 241st American Chemical Society National Meeting, Anaheim, CA, March 2011
54. Luxford, C.J.; **Bretz, S.L.** "Using Visualizations and Representations to Teach and Learn Chemistry," 241st American Chemical Society National Meeting, Anaheim, CA, March 2011
53. Luxford, C.J.; **Bretz, S.L.** "Revealing Student Knowledge of Chemical Bonding through the use of Multiple Representations," 241st American Chemical Society National Meeting, Anaheim, CA, March 2011
52. Linenberger, K.; **Bretz, S.L.** "Misconceptions Uncovered by the Enzyme-Substrate Interactions Concept Inventory," 241st American Chemical Society National Meeting, Anaheim, CA, March 2011
51. Linenberger, K.; **Bretz, S.L.** "Important Characteristics of Enzyme-Substrate Interactions through the Eyes of Biochemistry Students," 241st American Chemical Society National Meeting, Anaheim, CA, March 2011
50. Jensen, J.D.; **Bretz, S.L.** "Misconceptions about Acids and Bases," 240th American Chemical Society National Meeting, Boston, MA, August 22, 2010
49. Brandriet, A.R.; **Bretz, S.L.** "Triangulating Assessments: Multiple Measures of Student Learning," 21st Biennial Conference on Chemical Education, Denton, TX, July 2010
48. Murata, A.V.; **Bretz, S.L.** "Investigating Student Conceptions about Atomic Emission," 21st Biennial Conference on Chemical Education, Denton, TX, July 2010
47. Luxford, C.J.; **Bretz, S.L.** "Investigating Representational Competence with Respect to Covalent Bonding," 21st Biennial Conference on Chemical Education, Denton, TX, July 2010
46. Jensen, J.D.; **Bretz, S.L.** "Investigating Student Ideas about Acid-Base Reactions," 21st Biennial Conference on Chemical Education, Denton, TX, July 2010
45. Bindis, M.P.; **Bretz, S.L.** "Misconceptions about Intermolecular Forces as Revealed through Interviews about Chromatography: A Pilot Study," 21st Biennial Conference on Chemical Education, Denton, TX, July 2010
44. Linenberger, K.; Lorigan, G.; Crowder, M.W.; McCarrick, R.; **Bretz, S.L.** "What is Fresh Meat's True Color? An Upper-Level Undergraduate Laboratory Investigating the Effects of Ligand Binding Using Optical and Paramagnetic Resonance Spectroscopy," 21st Biennial Conference on Chemical Education, Denton, TX, July 2010
43. Linenberger, K.; **Bretz, S.L.** "Eliciting Misconceptions of Enzyme Catalysis Using the Constructivist Interview of Representational Competence," 21st Biennial Conference on Chemical Education, Denton, TX, July 2010
42. Towns, M.H.; **Bretz, S.L.** "Faculty Perspectives of Undergraduate Chemistry Laboratory: Goals for the Lab," The Royal Australian Chemical Institute's National Convention, Melbourne, Australia, July 4-8, 2010
41. Linenberger, K.; **Bretz, S.L.** "Using Multiple Representations to Elicit Misconceptions of Enzyme Catalysis," 239th American Chemical Society National Meeting, San Francisco, CA, March 23, 2010

CONTRIBUTED PAPERS (*undergraduates & high school teachers underlined*)

40. O'Donnell, M.E.; **Bretz, S.L.** "Exploring the Connections between Children's Ideas about the Word 'Chemical' and their Understanding of Chemical and Physical Change," 239th American Chemical Society National Meeting, San Francisco, CA, March 24, 2010
39. Bruck, A.; Towns, M.; **Bretz, S.L.** "Developing a Survey Instrument Using Factor Analytical Techniques," 239th American Chemical Society National Meeting, San Francisco, CA, March 24, 2010
38. Linenberger, K.; Luxford, C.; **Bretz, S.L.** "Data Collection with the Livescribe™ Pulse™ Smartpen," 239th American Chemical Society National Meeting, San Francisco, CA, March 23, 2010
37. Sanabria-Rios, D.; **Bretz, S.L.** "Is There Any Relationships between Faculty Expectations about Learning Chemistry and the Construction of Exam Questions?" 61st Southeastern Regional ACS Meeting, San Juan, PR, October 21, 2009
36. O'Donnell, M.E.; **Bretz, S.L.** "Investigating Children's Ideas about Chemicals," 237th American Chemical Society National Meeting, Salt Lake City, UT, March 23, 2009
35. O'Donnell, M.E.; **Bretz, S.L.** "Improving Retention in General Chemistry: POGIL Recitations for Weaker Math Students," 237th American Chemical Society National Meeting, Salt Lake City, UT, March 23, 2009
34. Fay, M.E.; **Bretz, S.L.** "Characterizing the Level of Inquiry in Laboratory," 20th International Conference on Chemical Education, Mauritius, August 7, 2008
33. Fay, M.E.; Towns, M.H.; **Bretz, S.L.** "Mapping the Dimensions of the Undergraduate Chemistry Laboratory," 20th International Conference on Chemical Education, Mauritius, August 2008
32. Fay, M.E.; **Bretz, S.L.** "Faculty perspectives of the Undergraduate Laboratory," 20th Biennial Conference on Chemical Education, Indiana University, July 2008
31. O'Donnell, M.E.; **Bretz, S.L.** "Laboratory Experiments that Introduce Different Calibration Methods," 20th Biennial Conference on Chemical Education, Indiana University, July 2008
30. O'Donnell, M.E.; **Bretz, S.L.** "Investigating Children's Ideas about Chemicals," 20th Biennial Conference on Chemical Education, Indiana University, July 2008
29. Grove, N.P.; **Bretz, S.L.** "Change in Structure: The Evolution of Student Difficulties in a Spiral Organic Curriculum," 235th American Chemical Society National Meeting, New Orleans, LA, April 7, 2008
28. Fay, M.E.; **Bretz, S.L.** "Characterizing the Level of Inquiry in Undergraduate Laboratory," 235th American Chemical Society National Meeting, New Orleans, LA, April 7, 2008
27. Fay, M.E.; **Bretz, S.L.** "Trajectories for Inquiry in the Chemistry Laboratory," 235th American Chemical Society National Meeting, New Orleans, LA, April 7, 2008
26. Fay, M.E.; **Bretz, S.L.** "A rubric to characterize inquiry in the undergraduate chemistry laboratory," 233rd American Chemical Society National Meeting, Chicago, IL, March 27, 2007
25. McSparrin, L.; **Bretz, S.L.** "The Effect of Guided Inquiry on Student Misconceptions in Chemistry," 19th Biennial Conference on Chemical Education, Purdue University, July 31, 2006
24. Grove, N.P.; **Bretz, S.L.** "CHEMX: Assessment of cognitive expectations for learning chemistry," 19th Biennial Conference on Chemical Education, Purdue University, July 31, 2006
23. **Bretz, S.L.** "Equilibrium and stress: Balancing one marriage, a two-body problem, and three children," 231st American Chemical Society National Meeting, Atlanta, GA, March 26, 2006.
22. **Bretz, S.L.** "Professional Development for High School Chemistry Teachers: Integrating Pedagogy and Content through Teacher Research," 18th Biennial Conference on Chemical Education, Iowa State University, July 21, 2004
21. Grove, N.P.; **Bretz, S.L.** "CHEMX: Assessing Students' Cognitive Expectations for Learning Chemistry," 18th Biennial Conference on Chemical Education, Iowa State University, July 20, 2004
20. McSparrin, L.; **Bretz, S.L.** "A Portfolio of Guided Inquiry Activities to Address National Science Education Standards Related to the Quantum Theory," 18th Biennial Conference on Chemical Education, Iowa State University, July 20, 2004
19. Smith, K.C.; Nakhleh, M.B.; **Bretz, S.L.** "Analysis of the ACS Blended General Chemistry Exams Using a New Coding Framework," American Chemical Society Central Regional Meeting, Indianapolis, IN, June 3, 2004
18. McSparrin, L.; Snyder, B.; DiMuzio, S.J.; Hunter, A.D.; **Bretz, S.L.** "A Research-Based M.S. Program Designed to meet both Teacher's Professional Development Needs and the Research Needs at PUIs," 223rd American Chemical Society National Meeting, Orlando, FL, April, 2002
17. McSparrin, L.; Snyder, B.; DiMuzio, S.J.; Hunter, A.D.; **Bretz, S.L.** "X-Ray Diffraction Analysis throughout the Curriculum: A Powerful Tool for Understanding Molecular Structure and Bonding," 223rd American Chemical Society National Meeting, Orlando, FL, April, 2002
16. **Bretz, S.L.** "Professional Development for High School Chemistry Teachers: Integrating Pedagogy and Content through Teacher Research," 226th American Chemical Society National Meeting, New York, NY, September 7, 2003
15. **Bretz, S.L.** "Issues of Data Quality in Chemistry Education Research," 222nd American Chemical Society National Meeting, Chicago, IL, August 28, 2001
14. **Bretz, S.L.** "Impact of Making Connections Upon Student Learning," 221st American Chemical Society National Meeting, San Diego, CA, April 2, 2001

CONTRIBUTED PAPERS (*undergraduates & high school teachers underlined*)

13. **Bretz, S.L.** "Making Connections & Measuring Learning Styles," Gordon Research Conference on Innovations in College Chemistry Teaching, Ventura, CA, January 8, 2001
12. **Bretz, S.L.** "Capturing Them While They're Still Undergraduates: Theory & Practice as an Introduction to the Dynamics of Teaching Chemistry," 16th Biennial Conference on Chemical Education, University of Michigan, August 2, 2000
11. **Bretz, S.L.** "Concept Maps as a Tool to Assess and Promote Learning in the Chemistry Lecture," 217th American Chemical Society National Meeting, Anaheim, CA, March 25, 1999
10. **Bretz, S.L.** "Atoms, Molecules, and Receptors: How Does Your Nose Know? Teaching on a Need-to-Know Basis," 217th American Chemical Society National Meeting, Anaheim, CA, March 24, 1999
9. **Bretz, S.L.** "An Argument for Interpretivism in Chemistry Education Research," 15th Biennial Conference on Chemical Education, University of Waterloo, August 11, 1998
8. **Bretz, S.L.** "The Importance of Shared Meaning: Concept Mapping as a Learning Tool in the Large Lecture Chemistry Course," 215th American Chemical Society National Meeting, Dallas, TX, April 1, 1998
7. **Bretz, S.L.** "Chemistry Conversations: Student Journals and Real-time Course Revision," 213th American Chemical Society National Meeting, San Francisco, CA, April 16, 1997
6. **Bretz, S.L.** "Assessing the Affective Domain: Keeping Journals and Constructing Theories," 213th American Chemical Society National Meeting, San Francisco, CA, April 15, 1997
5. **Bretz, S.L.** "Assessing the Affective Domain: Keeping Journals and Constructing Theories," Gordon Research Conference on Innovations in College Chemistry Teaching, Plymouth, NH, July 1, 1996
4. **Bretz, S.L.** "The Chemistry of Smell Module: How Do We Detect Odors?" Gordon Research Conference on Innovations in College Chemistry Teaching, Plymouth, NH, July 3, 1996
3. **Bretz, S.L.** "Concept Mapping: A Tool for Chemical Education Research," 211th American Chemical Society National Meeting, New Orleans, LA, March 26, 1996
2. **Bretz, S.L.** "Promoting Science Literacy: The Role of Meaningful Learning," 13th Biennial Conference on Chemical Education, Bucknell University, August 3, 1994
1. **Bretz, S.L.;** Meinwald, J. "The Language of Chemistry," 13th Biennial Conference on Chemical Education, Bucknell University, August 1, 1994

PROFESSIONAL SOCIETY MEMBERSHIPS

- American Association for Advancement of Science, Chemistry Section & Education Section (AAAS)
- American Chemical Society, Division of Chemical Education (ACS)
- Council on Undergraduate Research (CUR)
- Iota Sigma Pi, National Honor Society for Women in Chemistry (□□□)
- National Association of Research in Science Teaching (NARST)
- National Science Teachers Association (NSTA)
- School Science and Mathematics Association (SSMA)
- Society for College Science Teaching (SCST)

PROFESSIONAL SERVICE (*National & International*)**NATIONAL ACADEMY OF SCIENCES**

- *Member*, National Research Council Committee on Status, Contributions, and Future Directions of Discipline Based Education Research, 2009–2012

NATIONAL SCIENCE FOUNDATION

- *Panel Reviewer*
 - College of Reviewers: 2018 – present
 - Division of Chemistry: October 2010
 - Division of Research on Learning in Formal and Informal Settings: February 2014, October 2009, February 2004
 - Division of Undergraduate Education: March 2017, January 2016, October 2015, November 2013, March 2007, March 2006, February 2005, February 2004
- *External Evaluator*
 - Purdue University, "Transforming Undergraduate STEM Education Research Conferences," DUE–0941515, DUE–0941191, DUE–1551038; 2010, 2012, 2017
 - Rochester Institute of Technology, "Transforming the Organic Chemistry Experience: Development, Implementation and Evaluation of Studio Based Modules," DUE–1245160, 2013–2017
 - Otterbein College, "Experimental Determination of Chemical Structure in the Undergraduate Curriculum: A Data–Driven Approach," DUE–0942850, 2010–2013
 - Grand Valley State University, "FT-NMR: Hands–On Access in the Undergraduate Curriculum," DUE–0087655, 2000–2005

PROFESSIONAL SERVICE (*National & International*)

- *Advisory Board Member*
 - University of Wisconsin Madison, “Supporting Chemistry Learning with Adaptive Support for Connection Making between Graphical Representations in a Cognitive Tutoring System,” DUE–1611782, 2016–current
 - Mathematical Association of America, “Progress through Calculus,” DUE–1430540, 2014–current
 - Purdue University, “Transforming Research in Undergraduate STEM Education Conferences,” DUE–0941515, 0941191, 2010–2014
 - University of Nevada Las Vegas, “Collaborative Research: Advancing Chemistry by Enhancing Learning in the Laboratory (ACELL),” DUE–1023048, 2010–2013
 - Georgia State University, “Center for Workshops in the Chemical Sciences,” DUE, 2004–2010
 - Clemson University, “EnviroChemLibrary: Resources for Teaching and Learning in Science,” DUE–9952315, 2000–2003
- *Conference Organizer*
 - Chemistry Education Research Graduate Student & Post-Doc Professional Development Conference; Miami University, Oxford, OH; 2009, 2011, 2013, 2017

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

- *Proposal Reviewer*, Annual Meeting, 2013 – present
- *Invited Participant*, STEM Discipline-Based Education Research Alliance, 2017
- *Invited Participant*, Workshop on Measurement of Teaching Practices in Undergraduate STEM, 2012–2013

GORDON RESEARCH CONFERENCE on CHEMISTRY EDUCATION RESEARCH AND PRACTICE

- *Conference Chair*, Connecticut College, June 26 –July 1, 2005
- *Conference Vice-Chair*, Ventura, CA, January 4–9, 2004
- *Discussion Leader*: June 2011, June 2009, January 2000, January 1998, January 1994

AMERICAN CHEMICAL SOCIETY EXAMINATIONS INSTITUTE

- *Chair of the Board*, Board of Trustees, 2009–2014
- *Trustee*, Board of Trustees, 2002–2015
- *Chair*, Search Committee for Director of ACS Examinations Institute, 2014–2015
- *Member*, General Chemistry Exam Writing Committee, 1994–1999

AMERICAN CHEMICAL SOCIETY DIVISION OF CHEMICAL EDUCATION

- *Member*, Executive Committee, 2012–2014
- *Member*, AdHoc Financial Planning Committee, 2009–2014
- *Member*, Chemistry Education Research Committee, 1994–2004
- *Member*, Regional Meetings Committee, 2003–2004
- *Member*, Program Committee, 2001–2006

AMERICAN CHEMICAL SOCIETY, CONFERENCES & SYMPOSIA ORGANIZATION

- *Program Co-Chair*, ACS National Meeting, Atlanta, GA, Spring 2006
- *Member*, 16th Biennial Conference on Chemistry Education, Organizing Committee, 1998–2000
- *Symposium Organizer*, ACS National Award for Research on the Teaching and Learning of Chemistry
 - Award Symposium for Marcy H. Towns (Purdue University), San Francisco, CA, April 2017
 - Award Symposium for Melanie Cooper (Michigan State University), Dallas, TX, March 2014
 - Award Symposium for Dorothy Gabel (Indiana University), Dallas, TX, March 2008
- *Symposium Organizer*, ACS National Award for George C. Pimentel Award in Chemical Education
 - Award Symposium for Thomas A. Holme (Iowa State University), San Francisco, CA, April 2017
- *Symposium Organizer*, ACS National Meetings
 - “Chemistry Misconceptions Research,” Anaheim, CA, Spring 2011
 - “Research in Chemistry Education,” Chicago, IL, Fall 2001
 - “Teaching and Learning: A Vision for the Next Millenium,” San Francisco, CA, Spring 2000
 - “Wanted: Faculty with Training and Experience. Charting a Course for Successful Research Programs in Chemical Education,” Anaheim, CA, Spring 1995
 - “Piaget, Constructivism, and Beyond,” Dallas, TX, Spring 1998 (co-organized with Mary Nakhleh)
 - “Tools and Theories: A Chemical Education Research Symposium,” New Orleans, Spring 1996
- *Symposium Organizer*, Biennial Conferences on Chemistry Education (BCCE)
 - “Chemistry Education Research about Multiple Representations,” University of Notre Dame, July 2018
 - “Chemistry Misconceptions,” Pennsylvania State University, July 2012
 - “Chemistry and National Science Education Standards,” Iowa State University, July 2008
 - “Learning to Teach Chemistry: Professional Development of High School Chemistry Teachers,” Iowa State University, July 18-22, 2004

PROFESSIONAL SERVICE (*National & International*)

- "Research in Chemistry Education," Western Washington University, July 29-31, 2002
- "Piaget, Constructivism, and Beyond," University of Michigan, August 2, 2000 (co-organized with Mary Nakhleh)

AMERICAN CHEMICAL SOCIETY EDUCATION DIVISION

- o *Member*, Advisory Board, ACS Sloan Foundation Workshop for Post-Doctoral Scholars in Chemistry, 2008–2009
- o *Workshop Consultant*, Petroleum Research Fund, January 2007
- o *Member*, High School Teacher Task Force, 2006–2007
- o *Member*, Strategic Planning Task Force, 2006–2007

NATIONAL INSTITUTES OF HEALTH

- o *Panel Reviewer*, February 2008

PROJECT KALEIDOSCOPE

- o *Member*, Advisory Board, NSF Collaborative for Empowering STEM Faculty: Pedagogies of Engagement, 2007 – 2009
- o *Consultant*, Keck Consultancy Program, University of Maine, 1997

COLLEGE BOARD

- *Consultant*, Standards for College Readiness Committee, March 2007 – March 2008
- *Assessment Consultant*, Science Item Development Committee, March 2006 – March 2007

OHIO ACADEMY OF SCIENCE

- *Judge*, State Science Day, 2006, 2007

ASHLAND UNIVERSITY

- *External Reviewer*, Program Review, Department of Chemistry, Geology, & Physics, 2007

FOUNDATION TO IMPROVE POST-SECONDARY EDUCATION

- *Member*, Advisory Board, University of Michigan–Dearborn, "A Capstone Course to Integrate Science and Sustain Professional Development in Elementary Science Education," 2000–2004

CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING

- *Moderator*, Youngstown State University, Teaching and Learning Across the Disciplines: Models of Scholarship, Carnegie Scholars Conference, February 23, 2001

BIG TEN ACADEMIC ALLIANCE (formerly the Committee on Institutional Cooperation)

- *Conference Chair*, "TA Training Workshop," CIC Chemical Education Interest Group, June 20–21, 1998

CHEMISTRY EDUCATION RESEARCH LISTSERV

- *Creator & Moderator*, 2008–2017

EDITORIAL BOARDS

- o *Journal of Chemical Education*, 2017 – present
- o *Royal Society of Chemistry Advances in Chemistry Education*, 2014 – present
- o *College Teaching*, 2005–2009

JOURNAL REVIEWER

- o *American Chemical Society Symposium Series*
- o *Chemistry Education Research and Practice*
- o *Higher Education Pedagogies*
- o *International Journal of Problem-based Learning*
- o *International Journal of Science and Mathematics Education*
- o *International Journal of STEM Education*
- o *Journal of Chemical Education*
- o *Journal of College Science Teaching*
- o *Journal of Excellence in College Teaching*
- o *Journal of Geoscience Education*
- o *Journal of Research in Science Teaching*
- o *Numeracy: Advancing Education in Quantitative Literacy*
- o *PLoS* (Public Library of Science)
- o *Research in Learning Technology*
- o *School Science and Mathematics*
- o *Science Education*
- o *The Chemical Educator*

UNIVERSITY SERVICE (*selected activities, at Miami University unless indicated otherwise*)

-
- President's Office
 - *Member*, Strategic Planning Steering Committee, 2018 – present
 - *Co-Chair*, Financial Sustainability Committee
 - *Member*, Academic Convergence Planning Committee, 2017
 - Finance & Business Services
 - *Chair*, University Fiscal Priorities and Budget Planning Committee, 2018–present
 - *Member*, University Fiscal Priorities and Budget Planning Committee, 2016–present
 - Enrollment Management
 - *Member*, Student Success Office, First Generation Students Advisory Board, 2018 - present
 - *Member*, Student Retention Committee, 2011
 - Academic Affairs
 - *Member-at-Large*, University Senate, 2017–present
 - *Member*, University Awards and Recognition Committee, 2013–2014, 2015–2016, 2017–2018
 - *Member*, Steering Committee, Institute for Miami Leadership Development, 2013–2015
 - *Member*, Institutional Review Board for Human Subjects Research, 2008–2013
 - *Member*, College of Arts & Science Competencies-based Curriculum Committee, 2012–2013
 - *Member*, Steering Committee, Graduate Program Review, 2012
 - *Member*, National Council for Accreditation of Teacher Education (NCATE) Review Team, 2005–2006
 - *Member*, College of Arts & Science Promotion & Tenure Committee (Youngstown State University)
 - *Member*, Provost's Council on Teaching and Learning, 2000–2002 (Youngstown State University)
 - Student Life
 - *Member*, University Disciplinary Board, 2011–2018
 - *Member*, University Title IX Hearing Panel, 2014–2016
 - *Member*, Greek Task Force, Summer 2010
 - *Faculty Advisor*, Alpha Phi International Fraternity, Gamma Nu Chapter, 2009–2010

DEPARTMENT OF CHEMISTRY & BIOCHEMISTRY SERVICE (*selected activities*)

-
- *Member*, Curriculum Revision Committee, 2018 - present
 - *Member*, Graduate Admissions Committee, 2011–present
 - *Member*, Chair's Planning Committee, 2008–present
 - *Member*, Promotion & Tenure Committee, 2005–present
 - *Member*, Lecturer Review Committee, 2005–present
 - *Member*, General Chemistry Committee 2005–present
 - *Chair*, Graduate Admissions Committee, 2011–2017
 - *Member*, Course Scheduling Committee, 2014–2016
 - *Member*, Faculty Hiring Committee, 2014

COMMUNITY SERVICE WITH SCHOOLS & TEACHERS (*selected activities*)

-
- *Co-organizer*, Science Week, Talawanda Local School District, Grades 1–5, 2006–2017
 - *Member*, Talawanda Local School District, Electives Review Committee, 2012–2013
 - *Mentor*, Talawanda Schools First-Year Teachers' Mentor Program, 2006–2007, 2009–2010
 - *Member*, MAC College Tech Prep Teacher Preparation Pathway Advisory Committee, 2005
 - *Member*, South Range School District Continuous Improvement Team, North Lima, OH, 2005
 - *Member*, Ohio Far East Region, Science Teachers Professional Development Committee, 2004–2005
 - *Workshop Organizer*, "Teaching Science through Inquiry," Professional Development Day for High School Chemistry Teachers, December 2003, December 2004 (Youngstown State University)