

DR. CHRISTINA V. SCHWARZ

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Christina Schwarz (Ph.D. 1998, U.C. Berkeley) is an associate professor of science education in the Teacher Education department at Michigan State University. She teaches undergraduate and graduate courses in science education, science, and research methodology and has been the elementary science subject area leader for MSU's teacher preparation program for ten years. Schwarz holds degrees in science, math, and technology education from the University of California at Berkeley (PhD and MA) and in earth, atmospheric and planetary science from MIT (BS). Her background includes conducting research in astronomy, designing curriculum materials for science learners and teachers, and working in classrooms with students and teachers. Schwarz's research primarily focuses on enabling students and teachers (PK-16) to understand and engage in scientific sense-making using practices – particularly model-based scientific inquiry. She also works with teachers to enhance their teaching practices to support sense-making. She is the principal investigator for the NSF grant, *Studying How Beginning Elementary Teachers Notice and Respond to Scientific Sense-making*, and the co-principle investigator for the NSF-funded projects *CT4EDU: Broadening Pathways into Computing by Developing Computational Thinking Competencies in Elementary Classrooms* and *Studying Students' Mechanistic Explanations Across Undergraduate Chemistry and Biology Courses*. She was also co-principle investigator of the NSF-funded *Supporting Scientific Practices in Elementary and Middle School Classrooms*, the *Head Start on Science* preschool science project and the *Modeling Hydrological Systems in Elementary Science* project. Schwarz received the MSU College of Education Excellence and Innovation in Teaching Award in 2005, has been an associate editor for the *Journal of Research in Science Teaching*, and has published articles in journals such as *Cognition & Instruction*, *Science Education*, the *Journal of Research in Science Teaching*, the *Journal for Science Teacher Education*, and *Science & Children*. Her co-edited book entitled *Helping Students Make Sense of the World Using Next Generation Science and Engineering Practices* was published in 2017 by NSTA press. She also served as a faculty mentor for the 2017 NARST Abell Institute in Taiwan.

EDUCATION

University of California, Berkeley College of Education Education in Math, Science, and Technology Dissertation: <i>Developing Students' Understanding of Scientific Modeling</i>	Ph.D.	1998
University of California, Berkeley College of Education Education in Math, Science, and Technology Master's Project: <i>Junior High-School Students' Conceptions and Related Inquiry About Mass and Gravity</i>	M.A.	1994
Massachusetts Institute of Technology	B. S.	1990

Earth, Atmospheric, and Planetary Science
 Minor in Music Performance

FACULTY APPOINTMENTS – RESEARCH & TEACHING EXPERIENCE

Associate Professor Department of Teacher Education College of Education, Michigan State University, East Lansing, MI	6/09 - present (on leave 4/11-10/11)
Assistant Professor Department of Teacher Education College of Education, Michigan State University, East Lansing, MI	1/02 – 6/09 (on leave 2003)
Adjunct Professor Science Education, Southern Connecticut State University, New Haven, CT	1/01- 6/01
Postdoctoral Fellow, Dr. Robert Sternberg Education Studies, Yale University, New Haven, CT	1/00- 8/00
Assistant Professor Elementary and Middle School Science Education Brooklyn College, City University of New York, Brooklyn, NY	1/99- 1/00
Research Assistant, Drs. Barbara White and John Frederiksen Education in Math, Science, and Technology University of California at Berkeley, Berkeley, CA	1/94 - 12/98
Research Assistant, Dr. Marcia Linn Education in Math, Science, and Technology University of California at Berkeley, Berkeley, CA	9/92 – 8/93
Science Data Analyst Space Telescope Science Institute, Baltimore, MD	1/91 – 5/92
Research Assistant, Dr. Claude Canizares, Director Center for Space Research, Massachusetts Institute of Technology, Cambridge, MA	9/87 – 12/90

PROFESSIONAL WRITING

Peer-Reviewed Book

Schwarz, C., Passmore, C., & Reiser, B. (Eds.). (2017). *Helping Students Make Sense of the World Using Next Generation Science and Engineering Practices*. Arlington, VA: The National Science Teachers Association (NSTA) Press.

Peer Reviewed Publications, Book Chapters, and Published Conference Chapters

(*graduate students and post-doc colleagues are noted with an asterisk)

- Akcaoglu, M., *Rosenberg, J. M., Ranellucci, J., & **Schwarz, C.** (2018). Outcomes from a self-generated utility value intervention on fifth and sixth-grade students' value and interest in science. *International Journal of Educational Research*, 87, 67-77.
- *Bierema, A., **Schwarz, C.**, & Stoltzfus, J. (2017). Engaging undergraduate biology students in scientific modeling: Analysis of group interactions, sense-making, and justification. *CBE—Life Sciences Education*, 16(4), ar68.
- *Zangori, L., *Vo, T., Forbes, C., & **Schwarz, C.** (2017). Supporting 3rd-grade students model-based explanations about groundwater: A quasi-experimental study of a curricular intervention. *International Journal of Science Education*, 1-22.
- Schwarz, C.**, Passmore, C. & Reiser, B. (2017). Moving beyond “knowing about” science to making sense of the world. In C. Schwarz, C. Passmore, & B. Reiser (Eds.), *Helping Students Make Sense of the World Using Next Generation Science and Engineering Practices*. Arlington, VA: NSTA Press.
- Schwarz, C.**, Passmore, C., & Reiser, B. (2017). Summary and conclusions. In C. Schwarz, C. Passmore, & B. Reiser (Eds.), *Helping Students Make Sense of the World Using Next Generation Science and Engineering Practices*. Arlington, VA: NSTA Press.
- Passmore, C., **Schwarz, C.**, & Mankowski, J. (2017). Developing and using models. In C. Schwarz, C. Passmore, & B. Reiser (Eds.), *Helping Students Make Sense of the World Using Next Generation Science and Engineering Practices*. Arlington, VA: NSTA Press.
- Berland, L., **Schwarz, C.**, *Krist, C., Kenyon, L., *Lo, A., & Reiser, B. (2016). Epistemologies in practice: Making scientific practices meaningful for students. *The Journal of Research in Science Teaching*, 53(7), 1082-1112.
- Campbell, T., **Schwarz, C.** & Windschitl, M. (2016). What we call misconceptions may be necessary stepping stones towards making sense of the world. *NSTA journals: The School Teacher* 83(3), *Science Scope* 39(7), and *Science & Children* 53(7), 28-33. (published across all three journals as part of NSTA's NGSS series).
- *Ke, Li, & **Schwarz, C.V.** (2016). Examining the influences of teachers' framing of modeling practices on elementary students' engagement in modeling. In C. Looi, J. Polman, U. Cress & P. Reimann (Eds.), *Transforming Learning, Empowering Learners: The Proceedings of the Twelfth International Conference of the Learning Sciences (ICLS), 2016, Volume 2*, (pp. 803- 806). Singapore: International Society of the Learning Sciences.
- *Baek, H. & **Schwarz, C.** (2015). The influence of curriculum, instruction, technology, and social interactions on two fifth-grade students' epistemologies in modeling throughout a model-based curriculum unit. *The Journal of Science Education and Technology*, 24(2-3), 216-233.
- Forbes, C. T., *Zangori, L., & **Schwarz, C. V.** (2015). Empirical validation of integrating learning performances for 3rd-grade students' model-driven explanation-construction. *The Journal of Research in Science Teaching*, 52(7), 895-921.
- Forbes, C., *Zangori, L., *Vo, T., & **Schwarz, C.** (2015). Supporting students' scientific modeling when learning about the water cycle. *Science & Children*.
- *Vo, T., Forbes, C., *Zangori, L., & **Schwarz, C.** (2015). Fostering third-grade students' use of scientific models with the water cycle: Elementary teachers' conceptions and practices. *International Journal of Science Education*, 37(15), 2411-2432.

*Zangori, L., Forbes, C.T., & **Schwarz, C. V.** (2015). Scaffolding 3rd-grade students' model-based reasoning about hydrologic cycling through curricular and instructional supports. *Science & Education, 24*(7-8).

Schwarz, C., *Ke, L., *Lee, M., & *Rosenberg, J. (2014). *Developing mechanistic model-based explanations of phenomena: Case studies of two fifth grade students' epistemologies in practice overTime*. In J. Polman, E. Kyza, D. O'Neill, ... , & L. D'Amico (Eds.), *Learning and Becoming in Practice: The Proceedings of the Eleventh International Conference of the Learning Sciences (ICLS), 2014, Volume 1*, (pp. 182-189). Boulder, CO: International Society of the Learning Sciences.

Forbes, C., **Schwarz, C.**, & *Zangori, L. (2014). *Development of an empirically-based learning performances framework for 3rd grade students' model-based explanations about hydrologic cycling*. In J. Polman, E. Kyza, D. O'Neill, ... , & L. D'Amico (Eds.), *Learning and Becoming in Practice: The Proceedings of the Eleventh International Conference of the Learning Sciences (ICLS), 2014, Volume 1*, (pp. 46-53). Boulder, CO: International Society of the Learning Sciences.

*Zangori, L., Forbes, C., & **Schwarz, C.** (2014). *Investigating the effect of curricular scaffolds on 3rd grade students' model-based explanations for hydrologic cycling*. In J. Polman, E. Kyza, D. O'Neill, ... , & L. D'Amico (Eds.), *Learning and Becoming in Practice: The Proceedings of the Eleventh International Conference of the Learning Sciences (ICLS) 2014, Volume 2*, (pp. 942-946). Boulder, CO: International Society of the Learning Sciences.

*Hokayem, H., & **Schwarz, C.** (2013). Engaging 5th graders in scientific modeling to learn about evaporation and condensation. *International Journal of Science and Mathematics Education, (12)* 49-72.

Schwarz, C., Reiser, B., Acher, A., Kenyon, L., & Fortus, D. (2012). *MoDeLS: Challenges in defining a learning progression for scientific modeling*. In A. Alonzo & A. Gotwals (Eds.) *Learning Progressions in Science (LeaPS)* (pp. 101-137). Boston, MA: Sense Publishers.

Schwarz, C. (2012). *Supporting scientific practices in elementary and middle school classrooms: The role of quantitative reasoning*. In R. Mayes, & L Hatfield (Eds.) *Quantitative Reasoning in Mathematics and Science Education: Papers from an international STEM Research Symposium WISDOM^e Monograph, Volume #3*. University of Wyoming.

*Baek, H., **Schwarz, C.**, *Chen, J, *Hokayem, H., & *Zhan, L. (2011). Engaging elementary students in scientific modeling: The MoDeLS 5th grade approach and findings. In M. S. Khine, & I. M. Saleh (Eds.) *Models and Modeling: Cognitive tools for scientific enquiry* (pp. 195-218). New York: Springer-Verlag.

Schwarz, C., Reiser, B., Davis, B., Kenyon, L, Acher, A., Fortus, D., Shwartz, Y., Hug, B., & Krajcik, J. (2009). Designing a learning progression for scientific modeling: Making scientific modeling accessible and meaningful for learners. *Journal of Research in Science Teaching, 46*(6), 632-654.

Schwarz, C. (2009). Developing preservice elementary teachers' knowledge and practices through modeling-centered scientific inquiry. *Science Education, 93*(4), 720-744.

*Mikeska, J., Anderson, A., & **Schwarz, C.** (2009). Principled reasoning about problems of practice. *Science Education, 93*(4), 678-686.

- Kenyon, L., **Schwarz, C.**, & Hug, B. (2008). The benefits of scientific modeling. *Science and Children*, 46(2), 40-44.
- Schwarz, C.**, *Gunckel, K., Smith, E., Covitt, B., *Bae, M., Enfield, M., & *Tsurusaki, B. (2008). Helping elementary pre-service teachers learn to use science curriculum materials for effective science teaching. *Science Education*, 92(2), 345-377.
- Schwarz, C.**, *Meyer, J., & *Sharma, A. (2007). Technology, pedagogy, and epistemology: Opportunities and challenges of using computer modeling and simulation tools in elementary science methods. *Journal of Science Teacher Education*, 18(2), 243-269.
- Schwarz, C.**, & *Gwekwerere, Y. (2007). Using a guided inquiry and modeling instructional framework (EIMA) to support pre-service K-8 science teaching. *Science Education*, 91(1), 158-186.
- Schwarz, C.**, & White, B. (2005). Meta-modeling knowledge: Developing students' understanding of scientific modeling. *Cognition and Instruction*, 23(2), 165-205.
- Schwarz, C.**, *Meyer, J., & *Sharma, A. (2004). *Preparing tomorrow's teachers to use technology: Analysis of pre-service elementary and middle school teachers' interactions with computer modeling and simulation tools*. Proceedings of the International Conference of the Learning Sciences, Santa Monica, CA.
- Schwarz, C.** (2002). *Is there a connection? The role of meta-modeling knowledge in learning with models*. In P. Bell, R. Stevens, & T. Satwidz (Eds.), *Keeping learning complex: The Proceedings of the fifth International Conference of the Learning Sciences (ICLS)*. Mahwah, NJ: Erlbaum. Retrieved from http://schwarz.wiki.educ.msu.edu/file/view/Schwarz_ICLS_metapaper.pdf
- White, B., & **Schwarz, C.** (1999). Alternative approaches to using modeling and simulation tools for teaching science. In N. Roberts, W. Feurzeig, & B. Hunter (Eds.), *Modeling and simulation in science and mathematics education* (pp. 226-256). New York: Springer-Verlag.

Peer Reviewed Publications Accepted with Revision

- *Haverly, C., Calabrese Barton, A., **Schwarz, C.**, Braaten, M. (accepted with minor revision). "Making space": How novice teachers create opportunities for equitable sense-making in elementary science. *Journal of Teacher Education*.
- *Krist, C., **Schwarz, C.**, Reiser, B. (accepted with minor revision). Identifying essential crosscutting epistemic heuristics for guiding mechanistic reasoning in science learning. *The Journal of the Learning Sciences*.
- *Ke, L. & **Schwarz, C.** (accepted with revision). "Explain how and why!": How a 5th grade teacher's use of epistemic considerations supported students' productive engagement in scientific modeling. Chapter to appear in A. Upmeier, D. Kruger, & J. vanDriel (Eds.) *Towards a competence-based view of models and modeling in science education*. Springer.

Under Revision or in Process

- Schwarz, C.V.**, Braaten, M., Haverly, C., Calabrese Barton, A. & de los Santos (manuscript presented at NARST 2018 and under revision for submission to *Cognition &*

Instruction). Sense-making moments: Elementary teachers' responsiveness towards disciplinary and equitable aspects of scientific sense-making.

Schwarz, C.V., Rosenberg, J., Akcaoglu, M. (submitted for review in 2016; reject and resubmit; under revision). A comparative longitudinal case study of two fifth-grade teachers' engagement in scientific modeling pedagogical practice. *Journal of Teacher Education*.

*Haverly, C., DeRosier, K., **Schwarz, C.**, Calabrese Barton, A. (submitted for review in 2016; rejected; under revision). *Responsiveness: Creating a Culture of Science for All*. Manuscript under revision.

Selected Manuscripts and Technical Reports – Not Included in Presentations

*Bierema, A., Stoltzfus, J., & **Schwarz, C.** (2015). The role of sense-making in undergraduate modeling activities. In Halverson, K. (committee chair). Proceedings: 2015 Biology Education Research Symposium, NABT (National Association of Biology Teachers) Professional Development Conference, Rhode Island, 11-14 November 2015.

Windschitl, M., **Schwarz, C.**, & Passmore, C. (2013, April). Examining our own practice: The role of NGSS in improving pre-service teacher preparation. NARST position paper in response to NGSS. Paper presented at the annual meeting of the National Association for Research in Science Teaching conference, Puerto Rico. May be retrieved from JRST website: <https://www.narst.org/NGSSpapers/preservice.cfm>

Schwarz, C. (2009, April). *A learning progression of elementary teachers' knowledge and practices for model-based scientific inquiry*. Paper presented at the American Educational Research Association, San Diego, CA.

Schwarz, C., Reiser, B., Fortus, D., Shwartz, Y., Acher, A., Davis, B., Kenyon, L., & Hug, B. (2009). *MoDeLS: Defining a learning progression for scientific modeling*. Proceedings of the Learning Progressions for Science (LeaPS) Conference, Iowa City, IA.

*Covitt, B., **Schwarz, C.**, *Mikeska, J., & *Bae, M. (2008). Facilitating preservice elementary teachers' engagement in reform science education practices through curriculum materials analysis boundary spanning activities. Unpublished technical manuscript.

Davis, E., Kenyon, L., Hug, B., *Nelson, M., *Beyer, C., **Schwarz, C.**, Reiser, B. (2008, January). *MoDeLS: Designing supports for teachers using scientific modeling*. Paper presented at the Association for Science Teacher Education, St. Louis, MO.

Schwarz, C. (2007, April). *Helping pre-service elementary teachers learn to use curriculum materials for effective science teaching: Synthesizing results from the ETCM project*. Paper presented at the American Educational Research Association, Chicago, IL.

*Rogat, A. & **Schwarz, C.** (2006). *Sequencing and supporting complex scientific inquiry practices in instructional materials for middle school students – Scientific modeling*. Paper presented in a symposium at the National Association for Research in Science Teaching conference, San Francisco, CA.

Richmond, G. & **Schwarz, C.** (2005). *Supporting the development of reform-based science teaching in urban contexts through work in professional inquiry communities*. Unpublished manuscript.

Schwarz, C., & White, B. (2002). *Developing a model-centered approach to science education*. Technical report available on website: <http://schwarz.wiki.educ.msu.edu/>

Schwarz, C. (1998). *Developing students' understanding of scientific modeling*. Doctoral dissertation, University of California, Berkeley, Graduate School of Education, Berkeley, CA.

GRANT Under review

Collaborative Research: Cultivating Responsive Elementary Science Teaching (CREST) by Fostering Expansive Sense-making under review
 National Science Foundation DRK12 proposal. \$1,795,724 (MSU)
 PIs: C. Schwarz, M. Braaten
 Conducting a research-practice partnership with urban school teachers to develop tools and discourse routines that foster elementary students' sense-making. Studying how cases and tools can inform pre-service teacher learning in teacher preparation programs.

FUNDED GRANTS

CT4EDU: Broadening Pathways into Computing by Developing Computational Thinking Competencies in Elementary Classrooms Fall 2017 - present
 National Science Foundation CS4all proposal. \$998,737
 PI: A. Yadav, Co-PIs: C. Schwarz, N. Shah & E. Bouck.
 Working with teachers and district administrators to integrate computational thinking (CT) into science and math in upper elementary schools. Studying teacher practices and development using CT approaches.

Studying Students' Mechanistic Explanations Across Undergraduate Chemistry and Biology Courses Fall 2017 - present
 National Science Foundation IUES proposal. \$598,925
 PI: J. Stoltzfus, MSU, biochemistry, Co-PIs: C. Schwarz, MSU, teacher education; M. Cooper, MSU, Chemistry; T. Long, MSU, plant biology.
 Studying how students engage in mechanistic reasoning across introductory chemistry and biology courses that use model-based approaches.

Improving Science Teaching and Learning: Studying How Beginning Elementary Teachers Notice and Respond to Students' Scientific Sense-making. 2013 – 2018
 National Science Foundation REESE grant (DRL1252439). \$499,997
 PI: C. Schwarz, MSU; Co-PIs: A. Calabrese-Barton, MSU & M. Braaten, UW Madison; Documenting and defining a range of beginning and experienced elementary teacher practices for noticing and responding to students' scientific sense-making and the contextual factors related to these practices.

Cluster Randomized Trial of the Efficacy of Early Childhood Science Education for Low Income Children 2011 – 2017
 National Science Foundation DRK-12 grant (DRL1119327). \$2,918,640
 PI: L. VanEgeren, MSU Outreach; Co-PIs: C. Schwarz, H. Brophy-Herb, N. Lownds, & S. Pierce, MSU.
 Developing coding and conducting analysis of preschool science teaching. Developing preschool science assessment measures of children's science ideas and reasoning including early scientific practices.

Supporting Scientific Practices in Elementary and Middle School Classrooms (Scientific Practices) 2010 – 2017

National Science Foundation DRK-12 grant (DRL1020316).	\$3,499,562
MSU subcontract:	\$479,246
<p>PI: B. Reiser, Northwestern U.; Co-PIs: C. Schwarz, MSU, L. Kenyon, Wright State University, L. Berland, U. Wisconsin. Designing a theoretical model that characterizes the integration and development of scientific practices for elementary and middle school students. Leading elementary school development and implementation of instructional trials including curriculum materials design and research as well as engaging in professional development with participating teachers to determine how to best support scientific modeling, explanation and argumentation practices.</p>	
<i>Developing Tools to Elicit and Analyze Scientific Modeling Practices In Groups of Undergraduate Students</i>	2014 – 2016
CREATE for STEM MSU grant.	\$98,000
<p>PI: J. Stoltzfus, MSU, biochemistry, Co-PI: C. Schwarz, MSU, teacher education; Designing and analyzing modeling tasks for college biology students learning about genetics. Determining the most effective ways to support undergraduates engaging in scientific modeling to learn genetic models and applications within small groups over time in large-lecture college classrooms.</p>	
<i>Modeling Hydrological Systems in Elementary Science (MoHSES)</i>	2012 – 2016
National Science Foundation DRK-12 grant (DRL1443223).	\$448,491
MSU subcontract:	\$62,699
<p>PI: C. Forbes, U. Nebraska; Co-PI; C. Schwarz, MSU. Designing and analyzing 3rd grade curriculum materials and assessments to engage students in scientific modeling. Determining effective methods for modifying curriculum materials that can foster scientific modeling as well as researching how 3rd grade students and their teachers can engage in the practice.</p>	
<i>Learning Progressions for Scientific Modeling (MoDeLS)</i>	2006 – 2010
<p>Co-PI NSF Instructional Materials Development grant (DRL0628199). MSU subcontract \$332,045. Designed learning progression of scientific modeling for elementary and middle school students. Led elementary school progression and instructional trials including curriculum materials design and research with participating teachers.</p>	
<i>Center for Curriculum Materials in Science (CCMS)</i>	2003 – 2008
<p>Senior researcher in NSF Center for Learning and Teaching (ESI 0227557). Led Elementary Teachers and Curriculum Materials (ETCM) research group. Conducted research to develop theory and methods for preparing elementary teachers to effectively use curriculum materials for teaching science. Past CCMS participation also included work on 3rd grade force and motion unit.</p>	
<i>Developing Leadership and Support for Professional Learning Communities for Urban Science Teaching (PI-CRUST)</i>	2002 – 2007
<p>Senior researcher in NSF Teacher Retention and Renewal grant (ESI 0138945). Bi-weekly study group with 6th grade Lansing School District teachers and summer professional development workshops around their curriculum.</p>	
<i>Collaborative Research: Developing the Next Generation of Middle School Science Materials – Investigating and Questioning Our World Through Science and Technology (IQWST)</i>	2005 – 2006

Senior researcher in NSF development project (ESI 0101780). Worked with team on designing 6th grade light unit – with a particular focus on the creation and use of light models. Worked with team on designing professional development program for IQWST teachers using the 6th grade curriculum materials.

The BIG Nature Lesson; Partnerships for Professional Development in Science 2003 – 2004

Co-PI, Michigan Department of Education \$99,877. Conducted professional development and consulted with participating scientists and teachers on the project.

Computer Modeling Tools for Elementary and Middle School Science Instruction 2002 – 2003

PI for PT3 mini-grant, 2002-2003; ~\$50,000. Taught and researched an approach helping pre-service teachers learn about and use computer modeling and simulation tools using our website.

The Role of Students' Epistemologies in Learning with Models. 2001

PI for Center for Innovative Learning Technology Seed Grant \$15,000.

Other Products

*Baek, H., Schwarz, C., Beyer, C., Kenyon, L., Hinze, P., & Mankowski, J. (2011). *MoDeLS: Would you drink the liquid that came from this dirty water? A 5th grade unit on evaporation and condensation investigating the phenomenon of a solar still.* Unpublished science curriculum unit, Michigan State University, East Lansing, MI.

Schwarz, C., & *Baek, H. (2008). *MoDeLS: Would you drink the liquid that came from this dirty water? A 5th grade unit on evaporation and condensation investigating the phenomenon of a solar still.*

Schwarz, C., *Meyer, J., *Sharma, A., & *Rajagopalan, V. (2002). *Modeling and simulation tools for elementary and middle school science instruction:* <http://ott.educ.msu.edu/2002pt3/INDEX.HTM>

Schwarz, C. (2000). *Scientific Inquiry & Modeling: Light, shadows, and day and night.* A 4th grade unit designed using triarchic theory of intelligence.

Schwarz, C. (2000). *Scientific Inquiry & Modeling: Our solar system.* A 4th grade unit designed using triarchic theory of intelligence.

INVITED TALKS

Schwarz, C. (2017, June). *Supporting Sense-making Practices in the Classroom: Research on Scientific Modeling and Teacher Noticing & Responding in Science Education.* Invited speaker for the International Conference on Glocalization in Science Education. National Taiwan Normal University, Taipei, Taiwan.

Schwarz, C. (2016, August). *Scientific Modeling Approaches Across a Spectrum of Learning in Science Education.* Invited speaker for the Modeling and Model-Based Reasoning in STEM Conference. Purdue University, West Lafayette, IN. Can be retrieved from: <https://polytechnic.purdue.edu/modeling-in-stem-conference>

- Schwarz, C.** (2014, November). *Scientific practices for elementary school classrooms*. Invited webinar for the National Science Teacher Association virtual conference on NGSS Practices in Action. Presentation agenda can be found at:
http://learningcenter.nsta.org/products/online_courses/VC_NGSS_Nov15_Agenda.aspx
- Schwarz, C.** (2014, November). *Scientific modeling for elementary and middle school classrooms*. Invited talk for the Panel on Modeling K-16 in the CREATE for STEM seminar series at Michigan State University, East Lansing, MI.
- Schwarz, C., & Passmore, C.** (2012, September). *Preparing for the Next Generation Science Standards – Developing and Using Models*. Web seminar presented for the National Science Teacher’s Association. Content and audio can be retrieved from:
http://learningcenter.nsta.org/products/symposia_seminars/NGSS/webseminar.aspx
- Schwarz, C.** (2012, May). *Supporting scientific practices in elementary and middle school classrooms: The role of learning progressions and quantitative reasoning*. Invited talk presented at the Quantitative Reasoning in Mathematics and Science Education STEM research symposium, Savannah, GA.

PRESENTATIONS

- *Ke, L., Krajcik, J., & **Schwarz, C.** (2018, March). Examining Middle School Students’ Development of Model-based Explanations over Time Using a Web-Based Modeling Tool. Poster presented at the meeting of the National Association for Research in Science Teaching, Atlanta, GA.
- *Larimore, R., **Schwarz, C.**, Van Egeren, L., & Lee, K. (2018, March). Preschool Teacher Observational Science Practice System (PTOSP). In **C. Schwarz** (chair), *Working towards Robust Early Childhood Science Education Approaches that Support Scientific Inquiry and Practices*. Symposium conducted at the meeting of the National Association for Research in Science Teaching, Atlanta, GA.
- Schwarz, C.**, Braaten, M., *Haverly, C., Calabrese Barton, A., & *de los Santos, E. (2018, March). Sense-making Moments: Teachers’ Responsiveness Towards Disciplinary and Equitable Aspects of Sense-making. In *C. Haverly (chair), *Approaches for Studying Equitable and Responsive Science Teaching*. Symposium conducted at the meeting of the National Association for Research in Science Teaching, Atlanta, GA.
- Schwarz, C.** (2018, March). Building Collaborations and Networks to Support Writing. Presenter at the pre-conference workshop on scholarly writing and innovations for NARST newcomers at the meeting of the National Association for Research in Science Teaching, Atlanta, GA.
- Schwarz, C.** (2018, March). Discussant for related paper set, “*Promoting Secondary Students’ Modeling Practice Using an On-Line Modeling Tool*” at the National Association for Research in Science Teaching meeting, Atlanta, GA.
- *Sharma, M., & **Schwarz, C.** (2018, March). Pre-service Science Teachers’ Noticing and Responding to Students’ Scientific Thinking. Poster presented at the meeting of the National Association for Research in Science Teaching, Atlanta, GA.

- *Sharma, M., & **Schwarz, C.** (2018, March). Characterizing Sense-making Conversations of Elementary Science Teacher Candidates. Paper presented at the meeting of the National Association for Research in Science Teaching, Atlanta, GA.
- Krajcik, J. & **Schwarz, C.** (2017, June). *Getting your research published!* Workshop at the Sandra K. Abell NARST Graduate Research Institute at the National Taipei Normal University, Taipei, Taiwan. Can be retrieved from:
<http://tinyurl.com/PublicationsAbell2017>
- Schwarz, C.** (2017, June). *What are your needs?* Introductory session at the Sandra K. Abell NARST Graduate Research Institute at the National Taipei Normal University, Taipei, Taiwan.
- Schwarz, C.** (2017, April). Discussant for related paper set, “*Supporting secondary students’ modeling practice using a web-based modeling tool*” at the National Association for Research in Science Teaching meeting, San Antonio, TX.
- *Vo, T., Forbes, C., Zangori, L., & **Schwarz, C.** (2017, April). *Comparing 3rd and 5th grade students’ model-based explanations about water.* Poster presented at the National Association for Research in Science Teaching meeting, San Antonio, TX.
- *Vo, T., Forbes, C., Zangori, L., & **Schwarz, C.** (2017, April). *A three-year longitudinal multi-case study exploring three elementary teachers’ model-based science instruction about water.* Paper presented at the National Association for Research in Science Teaching meeting, San Antonio, TX.
- Schwarz, C.** (2017, April). Discussant for roundtable “*Modeling in K-12 Science Classrooms: Layers of support of equitable implementation of next generation science standards practices*” at the American Educational Research Association Meeting, San Antonio, TX.
- *Vo, T., Forbes, C., Zangori, L., & **Schwarz, C.** (2017, April). *Exploring elementary teachers’ model based science instruction about water: A three-year longitudinal multi-case study.* Paper presented at the American Educational Research Association Meeting, San Antonio, TX.
- *Haverly, C., **Schwarz, C.**, Calabrese Barton, A., & Braaten, M. (2017, April). *Coaching as a model to support beginning teachers’ responsiveness to student sensemaking.* Poster presented at the American Educational Research Association Meeting, San Antonio, TX.
- Schwarz, C.**, & *Ke., L. (2017, April). *Longitudinal analysis of upper elementary and middle school students’ modeling practices.* Poster presented at the American Educational Research Association Meeting, San Antonio, TX.
- *Haverly, C., **Schwarz, C.**, Calabrese Barton, A., & Braaten, M. (2017, February). *Scaffolding to support novice teachers’ responsiveness.* Poster session presented at CREATE for STEM Mini-Conference, East Lansing, MI.
- Gerde, H., **Schwarz, C.**, Van Egeren, L, Pierce, S., Brophy-Herb, H., Larimore, R., Lownds, N Morris, B., Venugopal, V., Stein, M., Stoddard, D. (2017, February). *Cluster Randomized trial of the efficacy of early childhood science education.* Poster session presented at CREATE for STEM Mini-Conference, East Lansing, MI.

- Schwarz, C.**, Forbes, C., Krajcik, J., Damelin, D., Passmore, C., & Marcum-Dietrich, N. (2016, June). Scientific Modeling across the K-12 Continuum: Alignment Between Theoretical Foundations and Classroom Interventions. Symposium at the National Science Foundation DRK12 Principle Investigator's Meeting, Washington, D.C.
- Forbes, C., Vo., T., Zangori, L. & **Schwarz, C.** (2016, June). Modeling hydrologic systems in elementary science (MoHSES). Poster presented at the National Science Foundation DRK12 Principle Investigator's Meeting, Washington, D.C.
- Reiser, B., **Schwarz, C.**, Kenyon, L., Berland, L, Wilson, M., & Draney, K. (2016, June). Supporting Scientific Practices in Elementary and Middle School. Poster presented at the National Science Foundation DRK12 Principle Investigator's Meeting, Washington, D.C.
- *de los Santos, E., **Schwarz, C.**, Braaten, M., Calabrese Barton, A., & *Haverly, C. (2016, April). *Unexpected moments: Beginning elementary teachers' noticing and responding to their students' science ideas*. Paper presented at the meeting of the American Educational Research Association, Washington, DC.
- *Haverly, C., Calabrese Barton, A., **Schwarz, C.**, Braaten, M., *de los Santos, E. (2016, April). *Unanticipated opportunities for student sense-making when beginning teachers stall for time in elementary science discussions*. Paper presented at the meeting of the American Educational Research Association, Washington, DC.
- Bierema, A., Stoltzfus, J., & **Schwarz, C.** (2016, April). *The role of undergraduate modeling activities in eliciting group interactions, justification and sense-making*. Paper presented at the National Association for Research in Science Teaching, Baltimore, MD.
- *Ke, L., & **Schwarz, C.** (2016, April). *Teachers' Messages about modeling: A case study of two elementary teachers*. Paper presented at the National Association for Research in Science Teaching, Baltimore, MD.
- *Lee, M., **Schwarz, C.**, & *Ke, L. (2016, April). *Characterizing Changes Across Model-Based Units in Elementary Students' Epistemic Considerations on Scientific Modeling*. Paper presented at the National Association for Research in Science Teaching, Baltimore, MD.
- *Rosenberg, J., & **Schwarz, C.** (2016, April). *Examining the development of fifth and sixth grade students' epistemic considerations over time through an automated analysis of embedded assessments*. Paper presented at the National Association for Research in Science Teaching, Baltimore, MD.
- Schwarz, C.**, Calabrese Barton, A., Colley, C., *de los Santos, E., *Haverly, C., Rosebery, A., Tzou, C., & Warren, B. (2016, April). *Pathways towards engaging and equitable sense-making for elementary teachers and their students*. Symposium at the meeting of the National Association for Research in Science Teaching, Baltimore, MD.
- Schwarz, C.**, Calabrese Barton, A., Braaten, M., *Haverly, C., & *de los Santos, E. (2016, April). Beginning elementary teachers' noticing and responding to students' sense-making. In C.V. Schwarz (chair), *Pathways towards engaging and equitable sense-making for elementary teachers and their students*. Symposium conducted at the meeting of the National Association for Research in Science Teaching, Baltimore, Maryland.

- Schwarz, C.** & Van Egeren, L. (2016, April). *The development and analysis of a preschool science task: Observing and explaining sinking and floating*. Paper presented at the National Association for Research in Science Teaching, Baltimore, MD.
- *Vo, T., Forbes, C., L. Zangori, L. & **Schwarz, C.** (2016, April). *Learning to support students' model-based learning about the water cycle: A three-year longitudinal case study of two 3rd grade teachers*. Paper presented at the National Association for Research in Science Teaching, Baltimore, MD.
- Zangori, L., *Vo, T., Forbes, C., & **Schwarz, C.** (2016, April). *Exploring links between elementary students' model-based explanations and teachers' knowledge and practice with scientific models*. Paper presented at the National Association for Research in Science Teaching, Baltimore, MD.
- *Bierema, A., Stoltzfus, J., & **Schwarz, C.** (2016, February). *Group modeling activities foster collaboration and sense-making*. Poster session presented at CREATE for STEM Mini-Conference, East Lansing, MI.
- *Haverly, C., Braaten, M., Calabrese Barton, A., **Schwarz, C.** (2016, February). *A model for noticing and responding in support of equitable and engaged sense-making*. Poster session presented at CREATE for STEM Mini-Conference, East Lansing, MI.
- *Rosenberg, J., & **Schwarz, C.** (2016, February). *Examining fifth and sixth grade students' epistemic considerations through automated analysis of embedded assessment items*. Poster session presented at CREATE for STEM Mini-Conference, East Lansing, MI.
- Bierema, A., Stoltzfus, J., & **Schwarz, C.** (2015). The role of sense-making in undergraduate modeling activities. Oral Presentation. NABT (National Association of Biology Teachers) Professional Development Conference, Providence, Rhode Island, 11-14 November 2015.
- Bierema, A., Stoltzfus, J., & **Schwarz, C.** (2015). How do modeling activities in undergraduate biology courses facilitate and engage students in scientific practices? Oral Presentation. SABER (The Society for the Advancement of Biology Education) National Meeting 2015, Twin Cities, Minnesota, 30 July- 02 August 2015.
- Schwarz, C.** (2015, April). Advancing Learning Pathways to Environmental Literacy. In B. Covitt (Chair), *Learning Pathways to Environmental Science Literacy*. Discussant for symposium conducted at the National Association for Research on Science Teaching, Chicago, IL.
- Braaten, M., Calabrese-Barton, A., Berland, L., ... **Schwarz, C.**, & Thompson, J. (2015, April). Presenters in M. Braaten (Chair), *Developing, Refining, and Sustaining the Next Generation of Responsive Teaching*. Symposium conducted at the National Association for Research on Science Teaching, Chicago, IL.
- Forbes, C., *Zangori, L., *Vo, T., & **Schwarz, C.**, (2015, April). *Studying the Impact of a Design Intervention on 3rd-Grade Students' Model-Based Explanations for Water Systems*. Paper presented at the National Association for Research on Science Teaching, Chicago, IL.

- *Ke, L., **Schwarz, C.**, & Richmond, G. (2015, April). *Examining the Teacher's Role in Supporting Elementary Students' Meaningful Engagement in Scientific Modeling*. In A. Lo (Chair), *Leveraging the epistemic dimensions of scientific practice to support student's meaningful engagement in modeling*. Symposium conducted at the National Association for Research on Science Teaching, Chicago, IL.
- *Rosenberg, J.M., **Schwarz, C.V.**, & Lee, S.W.-Y., & Akcaoglu, M. (2015, April). A comparative longitudinal case study of the use of scientific modeling in the pedagogical practice of two fifth-grade science teachers. In A. Lo (Chair), *Leveraging the epistemic dimensions of scientific practice to support student's meaningful engagement in modeling*. Symposium conducted at the National Association for Research on Science Teaching, Chicago, IL.
- Schwarz, C.**, *Krist, C., *Lee, M., *Toyama, Y., & Reiser, R. (2015, April). Content generality and specificity of middle-school students' mechanistic reasoning when constructing model-based explanations of scientific phenomena. In L. Berland (Chair), *Leveraging the epistemic dimensions of scientific practice to support students' meaningful engagement in modeling*. Symposium conducted at the National Association for Research on Science Teaching, Chicago, IL.
- *Vo, T., Forbes, C., *Zangori, L., & **Schwarz, C.**, (2015, April). *Exploring Elementary Teachers' Knowledge and Practices for Model-Based Science Instruction about the Water Cycle*. Paper presented at the National Association for Research on Science Teaching, Chicago, IL.
- *Bierema, A., Stoltzfus, J. & **Schwarz, C.** (2015, February). *How do Modeling Activities in Undergraduate Biology Courses Facilitate and Engage Students' in Sense-making?* Poster presented at the CREATE for STEM Conference, Michigan State University, East Lansing, MI.
- *Ke, L., & **Schwarz, C.** (2015, February). *Examining the Teacher's Role in Supporting Elementary Students' Meaningful Engagement in Scientific Modeling*. Poster presented at the CREATE for STEM Conference, Michigan State University, East Lansing, MI.
- *Lee, M., **Schwarz, C. V.**, *Ke, L. & *Rosenberg, J. (2015, February). *Elementary Students' Epistemic Considerations in the Scientific Practice of Modeling*. Poster presented at the CREATE for STEM Conference, Michigan State University, East Lansing, MI.
- *Rosenberg, J.M., Akcaoglu, M., **Schwarz, C.V.**, & Lee, S.W.-Y. (2015, February). *Comparative longitudinal case studies of two middle school teachers' use of scientific modeling*. Poster presented at the Create4Stem MiniConference 2015, East Lansing, MI.
- Van Egeren, L. A., **Schwarz, C. V.**, Gerde, H., Morris, B., Pierce, S., Brophy-Herb, Lownds, N., Stein, M., & Stoddard, D. (2015, February). *Cluster-randomized trial of the efficacy of early childhood science education with low-income children: Years 1-3*. Poster presented at the CREATE for STEM Conference, Michigan State University, East Lansing, MI.
- *Rosenberg, J.M., **Schwarz, C.**, Akcaoglu, M., & Lee, S. W.-Y. (2014, October). *Comparative longitudinal case studies of two middle school teachers' use of scientific modeling*. Poster presented at the Advances in Educational Psychology Conference. Alexandria, VA.

- Forbes, C., **Schwarz, C.**, Zangori, L., & Vo, T. (2014, August). Modeling hydrologic systems in elementary science (MoHSES). Poster presented at the National Science Foundation DRK12 Principle Investigator's Meeting, Washington, D.C.
- Reiser, B., **Schwarz, C.**, Kenyon, L., Berland, L., Wilson, M. & Draney, K. (2014, August). Supporting scientific practices in elementary and middle school. Poster presented at the National Science Foundation DRK12 Principle Investigator's Meeting, Washington, D.C.
- Schwarz, C.**, Reiser, B., Berland, L., & Kenyon, L. (2014, August). Supporting Scientific Practices in Elementary and Middle School Classrooms – What a Learning Progression Perspective Can Bring to Assessment and Instruction. Talk presented at a session entitled, "Using Learning Progressions for Classroom Assessment and Teaching" at the National Science Foundation's DRK12 principal investigator's meeting, Washington, D.C. Can be retrieved from: <http://cadrek12.org/session/using-learning-progressions-classroom-assessment-and-teaching>.
- Van Egeren, L., **Schwarz, C.**, Gerde, H., Morris, B., Pierce, S. Brophy-Herb, H., Lownds, N., Stein, M., Stoddard, D. (2014, August). Cluster randomized trial of the efficacy of early childhood science education with low-income children: Years 1-3. Poster presented at the National Science Foundation DRK12 Principle Investigator's Meeting, Washington, D.C.
- Forbes, C.T., *Zangori, L., & **Schwarz, C.** (2014, April). *Mapping concepts to systems: Fostering 3rd-grade students' use of models to explain hydrologic phenomena*. Paper presented at the annual meeting of the National Association for Research in Science Teaching, Pittsburgh, PA.
- Forbes, C. T., **Schwarz, C.**, & *Zangori, L. (2014, April). *Development of an empirically grounded learning performances framework for 3rd-grade students' model-based explanations about water*. Paper presented at the annual meeting of the American Educational Research Association, Philadelphia, PA.
- Kenyon, L., Berland, L., Reiser, B., & **Schwarz, C.** (2014, April). An epistemological-based learning progression for scientific argumentation embedded in system of practice. A paper presented at the annual meeting of National Association for Research in Science Teaching, Pittsburgh, PA.
- *Lee, M., **Schwarz, C.**, *Ke, L., & *Rosenberg, J. (2014, April). Analyzing fifth-grade students' engagement in scientific modeling: Changes in students' epistemologies-in-practice over time. Paper presented at the annual meeting of the National Association for Research in Science Teaching, Pittsburgh, PA.
- *Ke, L., **Schwarz, C.**, *Lee, M., & *Rosenberg, J. (2014, April). Examining Elementary Students' Attention to Mechanisms as They Engage in Scientific Modeling Across Content Areas. Paper presented at the annual meeting of the National Association for Research in Science Teaching, Pittsburgh, PA.
- *Zangori, L., Forbes, C.T., & **Schwarz, C.** (2014, April). *Investigating the effect of curricular scaffolds on 3rd-grade students' model-based reasoning about the water cycle*. Poster presented at the annual meeting of the American Educational Research Association, Philadelphia, PA.

- *Zangori, L., Forbes, C. T., & **Schwarz, C.** (2014, April). *Elementary students' model-based explanations for botanical components of the water cycle*. Poster presented at the annual meeting of the National Association for Research in Science Teaching, Pittsburgh, PA.
- *Ke, L., *Lee, M., *Rosenberg, J., & **Schwarz, C.** (2014, February). *Modeling across content areas: Examining elementary students' attention to mechanism*. Poster presented at the CREATE for STEM conference, Michigan State University.
- Schwarz, C.**, Berland, L., Kenyon, L., & Reiser, B. (2013, May). *Epistemologies in practice: Making scientific practices epistemologically-meaningful for students*. Poster presented at the CREATE for STEM conference, Michigan State University.
- Schwarz, C. V.**, *Akcaoglu, M., *Ke, L., *Zhan, L. (2013, April). *Fifth grade students' engagement in modeling practice across content areas: What epistemologies in practice change over time and how?* Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA.
- Reiser, B., Kenyon, L., & **Schwarz, C.**, (2013, April). A learning progression for argumentation, explanation, and modeling practices. Symposium presentation at the annual meeting of the American Educational Research Association, San Francisco, CA.
- Kenyon, L., **Schwarz, C.**, Berland, L., & Reiser, R. (April, 2013). *Supporting students' meaningful use of evidence when modeling*. Paper presented at the annual meeting of the National Association for Research in Science Teaching conference, Puerto Rico.
- Zangori, L., Forbes, C.T., & **Schwarz, C.** (2013, November). *Elementary students' model-based explanations about the water cycle*. Paper presented at the annual meeting of School Science and Mathematics, San Antonio, TX.
- Reiser, B., **Schwarz, C.**, Kenyon, L., & Berland, L. (2012, June). *Supporting Scientific Practices in Elementary and Middle School*. Poster presented at the 2012 Discovery Research K-12 PI Meeting, Arlington, VA.
- Van Egeren, L. A., Gerde, H., **Schwarz, C.**, Lownds, N., Pierce, S., Reyes-Gastelum, D., Morris, B., Brophy-Herb, H., & Stein, M. (2012, June). *Cluster-randomized trial of the efficacy of early childhood science education with low-income children*. Poster presented at the 2012 Discovery Research K-12 PI Meeting, Arlington, VA.
- Schwarz, C.** (2012, May). *Improving K-12 science teaching and learning through research*. Invited panel presentation for the CREATE for STEM conference. Michigan State University.
- Schwarz, C.** (2012, May). *Supporting scientific practices in elementary and middle school classrooms*. Poster presented at the CREATE for STEM conference. Michigan State University.
- Schwarz, C.**, *Baek, H., *Zhan, L., & *Akcaoglu, M. (2012, March). *Fostering elementary students' productive engagement in scientific modeling*. Paper presented at the annual meeting of the National Association for Research in Science Teaching conference, Indianapolis, Indiana.
- *Baek, H., & **Schwarz, C.**, (2011, April). *How teachers and students make sense of and perform consensus model construction in two 5th grade classrooms*. Poster presented at the National Association for Research in Science Teaching conference in Orlando, FL as part

of a symposium entitled, "Supporting Elementary and Middle School Students in Developing, Using, and Refining Scientific Models."

*Zhan, L., *Baek, H., *Chen, J., & **Schwarz, C.** (2011, April). *Investigating changes in the nature of 5th graders' expressed models with respect to scale and dynamic aspects.* Poster presented at the National Association for Research in Science Teaching conference in Orlando, FL as part of a symposium entitled, "Supporting Elementary and Middle School Students in Developing, Using, and Refining Scientific Models."

Schwarz, C., *Baek., H., *Chen., J., *Hokayem, H. & *Zhan., L. (2010, April). *Engaging Elementary Students in Scientific Modeling: The MoDeLS 5th grade Approach and Findings.* Paper presented at the National Association for Research in Science Teaching conference in Philadelphia, PA invited as part of an administrative symposium entitled, "Representational Reasoning in the Teaching and Learning of Science."

*Hokayem, H., *Chen, J., *Baek., H. *Zhan., L., & **Schwarz, C.** (2010, April). *The affordances and challenges of scientific modeling in a 5th grade unit on evaporation and condensation.* Paper presented at the National Association for Research in Science Teaching conference in Philadelphia, PA.

Reiser, B., **Schwarz, C.**, Acher, A., Kenyon, L., Buckingham, B., & *Chen, J. (2010, April). *MoDeLS: Developing Modeling Practices Across Contexts.* Poster presented at the National Association for Research in Science Teaching conference in Philadelphia, PA as part of a symposium entitled, "Developing and skills and practices of modeling."

Schwarz, C. (2010, February). *Measuring Outcomes and Collecting Feedback on Computational Thinking: Ideas from the MoDeLS project.* Invited talk presented to the National Academies workshop on Computational Thinking for Everyone in Washington D.C.

Schwarz, C., Reiser, B., Fortus, D., Shwartz, Y., Acher, A., Davis, B., Kenyon, L., & Hug, B. (2009, June). *MoDeLS: Defining a learning progression for scientific modeling.* Plenary talk given at the Learning Progressions for Science (LeaPS) Conference in Iowa City, IA.

*Chen, J., *Hokayem, H., & **Schwarz, C.** (2009, April). *Investigating the relationship between scientific modeling and content knowledge: A study of 5th graders' learning of evaporation and condensation through scientific modeling.* Poster presented at the National Association for Research in Science Teaching conference in Garden Grove, CA as part of a symposium entitled, "Supporting student and teacher learning about modeling practices."

*Baek, H., **Schwarz, C.**, & *Grueber, D. (2009, April). *Analysis of cultural dimensions of elementary school students' modeling practices.* Poster presented at the National Association for Research in Science Teaching conference in Garden Grove, CA as part of a symposium entitled, "Supporting student and teacher learning about modeling practices."

Reiser, B., **Schwarz, C.**, Kenyon, L., Fortus, D., & Acher, A. (2009, April). *A learning progression for elementary and middle school students' modeling practices.* Poster presented at the American Educational Research Association conference in San Diego,

CA as part of a symposium entitled, “Scientific modeling in the classroom: Investigating learning and instruction.”

- Schwarz, C.**, Reiser, B., Fortus, D., Krajcik, J., Roseman, J.E., Willard, T., & Acher, A. (2009, April). *Designing and testing the MoDeLS progression*. Paper presented at the National Association for Research in Science Teaching conference, Baltimore, MD.
- Kenyon, L., **Schwarz, C.**, Hug, B., *Baek, H., & Buckingham, B. (2008, April). *Incorporating modeling practices into elementary students’ scientific investigations*. Paper presented at the National Association for Research in Science Teaching conference, Baltimore, MD.
- Fortus, D., Weizman, A., Shwartz, Y., Merritt, J., & **Schwarz, C.** (2008, April). *Incorporating modeling practices into middle school project-based science*. Paper presented at the National Association for Research in Science Teaching conference, Baltimore, MD.
- Reiser, B., **Schwarz, C.**, Krajcik, J., & Davis, E. (2008, April). *Progress and challenges in making modeling practices meaningful*. Paper presented at the National Association for Research in Science Teaching conference, Baltimore, MD.
- Covitt, B., **Schwarz, C.**, *Bae, M., *Mikeska, J. (2008, April). *Facilitating preservice teachers’ development of professional practice through a boundary spanning activity*. Paper presented at the National Association for Research in Science Teaching conference, Baltimore, MD.
- Reiser, B., **Schwarz, C.**, Shwartz, Y., Kenyon, L., Fortus, D., Krajcik, J., Davis, E., Buckingham, B., & Ladewski, B. (2008, March). *MoDeLS: Articulating a learning progression for scientific modeling*. Poster presented at the American Educational Research Association conference in New York, NY as part of a symposium entitled, “Diverse Perspectives on the Development, Assessment, and Validation of Learning Progressions in Science.”
- Cartier, J., Gunckel, K., **Schwarz, C.**, Smith, E., Sink, W., Forman, E. (2008, March). *Examining elementary science curriculum materials: Using instructional frameworks to support pre-service teacher learning and practice*. Poster presented at the American Educational Research Association in New York, NY.
- Davis, E. & **Schwarz, C.** (2007, July). *Teachers and curriculum materials*. Invited Plenary at the Center for Curriculum Materials in Science, Knowledge Sharing Institute, Washington, D.C.
- Schwarz, C.** & Davis, E. (2007, July). *Follow-up to the Plenary on teachers and curriculum materials*. Symposium at the Center for Curriculum Materials in Science, Knowledge Sharing Institute, Washington, D.C.
- Schwarz, C.**, Weizman, A., & Fortus, D. (2007, July). *Designing and testing a learning progression for scientific modeling*. Paper presented at the Center for Curriculum Materials in Science, Knowledge Sharing Institute, Washington, D.C.
- McNeill, K., Kuhn, L., Krajcik, J., Reiser, B., **Schwarz, C.** & Swartz, Y. (2007, July). *Student practices*. Invited Plenary at the Center for Curriculum Materials in Science, Knowledge Sharing Institute, Washington, D.C.

- Covitt, B., **Schwarz, C.**, *Bae, M., *Mikeska, J., & Paluta, L. (2007, July). *Facilitating preservice teachers' development of professional practices through boundary spanning activities*. Poster presented at the Center for Curriculum Materials in Science, Knowledge Sharing Institute, Washington, D.C.
- *Gunckel, K., Smith, E., & **Schwarz, C.** (2007, July). *Frameworks for analyzing curriculum materials, planning, and teaching science lessons to all students*. Poster presented at the Center for Curriculum Materials in Science, Knowledge Sharing Institute, Washington, D.C.
- Elementary Teachers and Curriculum Materials Group (2007, July). *Helping preservice teachers learn to use science curriculum materials*. Poster presented at the Congressional Briefing from the Center for Curriculum Materials in Science, Knowledge Sharing Institute, Washington, D.C.
- Schwarz, C.** (2007, April). *Helping pre-service elementary teachers learn to use curriculum materials for effective science teaching; Synthesizing results from the ETCM Project*. Paper presented at the American Educational Research Association, Chicago, IL.
- Krajcik, J., Reiser, B., **Schwarz, C.**, & Fortus, D. (2007, April). *Supporting a learning progression for scientific modeling in project-based inquiry curricula*. Paper presented at the American Educational Research Association, Chicago, IL.
- Schwarz, C.**, Covitt, B., *Bae, M., *Mikeska, J., & Paluta, L. (2007, April). *Developing pre-service teachers' professional knowledge with curriculum materials analysis tasks*. Paper presented at the National Association for Research in Science Teaching conference, New Orleans, LA.
- Schwarz, C.**, Davis, E., Kanter, D., & Smith, S. (2006, July). *Learning progressions for describing teachers' use of curriculum materials*. Symposium presented at the Knowledge Sharing Institute of the Center for Curriculum Materials in Science, Ann Arbor, Michigan.
- *Bae, M., & **Schwarz, C.** (2006, July). *Helping elementary pre-service teachers learn to apply instructional frameworks using curriculum materials*. Poster presented at the Knowledge Sharing Institute of the Center for Curriculum Materials in Science, Ann Arbor, Michigan.
- Schwarz, C.**, Cartier, J., Davis, E., LaVan, S., Zembal-Saul, C. (2006, April). *Synthesizing approaches, frameworks, and findings for preparing effective elementary teachers*. Symposium at the National Association for Research in Science Teaching conference, San Francisco, CA.
- Schwarz, C.**, *Gunckel, K., *Enfield, M., *Grosshandler, D., *Tsurusaki, B., & Smith, E. (2006, April). *Enhancing elementary teachers' capabilities for critiquing, modifying, and enacting science curriculum materials; Empirical results from the elementary teachers and curriculum materials project*. Paper presented at the National Association for Research in Science Teaching conference, San Francisco, CA.
- Smith, E., *Gunckel, K., & **Schwarz, C.** (2006, April). *Enhancing elementary teachers' capabilities for critiquing, modifying, and enacting science curriculum materials; Conceptual frameworks for the Elementary Teachers and Curriculum Materials project*.

Paper presented at the National Association for Research in Science Teaching conference, San Francisco, CA.

- Schwarz, C.** (2005, July). *Teacher education and curriculum materials: Enabling teachers to critique, modify, and enact curriculum materials for effective science teaching*. Session of the Knowledge Sharing Institute of the Center for Curriculum Materials in Science, East Lansing, MI.
- Schwarz, C.,** & *Gwekwerere, Y. (2005, April). *Using a guided inquiry and modeling instructional framework (EIMA) to support pre-service K-8 science teaching*. Paper presented at the American Educational Research Association, Montreal, Canada.
- Richmond, G., **Schwarz, C.,** Smith, D., Smith, R. T., & Smith, E. (2005, April). *Supporting the development of reform-based science teaching in urban contexts through work in professional inquiry communities*. Symposium at the National Association for Research in Science Teaching, Dallas, Texas.
- Schwarz, C.** (2004, July). *Presentation of research related to scaffolding complex practices in curriculum materials, and learning sequences in curriculum materials*. The Knowledge Sharing Institute of the Center for Curriculum Materials in Science, Evanston, IL.
- Schwarz, C.,** *Meyer, J., & *Sharma, A. (2004, June). *Preparing tomorrow's teachers to use technology: Analysis of pre-service elementary and middle school teachers' interactions with computer modeling and simulation tools*. Paper presented at the International Conference of the Learning Sciences, Santa Monica, CA.
- Schwarz, C.,** *Meyer, J., & *Sharma, A. (2004, April). *Creating epistemologically-rich learning environments: Computer modeling tools for pre-service elementary and middle school teachers*. Paper presented at the American Educational Research Association Meeting, San Diego, CA.
- Schwarz, C.** (2002, October). *Is there a connection? The role of meta-modeling knowledge in learning with models*. Paper presented at the International Conference of the Learning Sciences, Seattle, WA.
- Schwarz, C.** (2002, April). *Using model-centered science instruction to foster students' epistemologies in learning with models*. Paper presented at the annual meeting for the American Educational Research Association, New Orleans, LA.
- Schwarz, C.** (2001, June). *Issues related to students' and teachers' epistemologies in learning with models*. Presentation at workshop entitled Epistemologies and Modeling. Concord Consortium, Concord, MA.
- Schwarz, C.** (2001, April). *Fostering students' and teachers' understanding of scientific modeling*. Talk presented at the annual meeting for the American Educational Research Association, Seattle, WA.
- Schwarz, C.** (2001, March). *Successes and challenges of teaching elementary science and science methods*. Talk given at Michigan State University, East Lansing, MI.
- Schwarz, C.** (2001 - 2000). *Developing a model-centered approach to science education*. Talk given at the University of Washington, Seattle, WA, the University of Texas, Austin, TX, the University of Pittsburgh, Pittsburgh, PA, the University of Colorado, Boulder, CO, the University of Virginia, Charlottesville, VA, Lehigh University, Bethlehem, PA, Brooklyn College, Brooklyn, NY, and the University of Connecticut, Storrs, CT.

- Schwarz, C.** (2000, October). *Using computer modeling tools to foster elementary school teachers' and students' understanding of scientific modeling*. Poster presented at the Center for Innovative Learning Technologies, Washington, DC.
- Schwarz, C.** (1999, April). *The effect of a model-oriented curriculum on seventh grade students' epistemological beliefs*. Paper presented at the American Educational Research Association, Montreal, Canada.
- Schwarz, C.** (1999, March). *What do seventh-grade students understand about scientific modeling from a model-oriented curriculum?* Paper presented at the National Association for Research in Science Teaching, Boston, MA.
- Schwarz, C., & White, B.** (1998, April). *Fostering middle school students' understanding of scientific modeling*. Paper presented at the American Educational Research Association, San Diego, CA.
- Schwarz, C., & White, B.** (1998, April). *The ThinkerTools model-design software and curriculum*. Paper presented at the National Association for Research in Science Teaching, San Diego, CA.
- Schwarz, C., & White, B.** (1998, January). *The ThinkerTools scientific inquiry and modeling project*. Work presented at the Center for Innovative Learning Technology's visualization conference, Berkeley, CA.
- Schwarz, C., & White, B.** (1997, June). *The ThinkerTools scientific inquiry and modeling software and curricula*. Work presented at an informal workshop on model building in science learning at the University of Colorado, Boulder, CO.
- Schwarz, C.** (1997, May). *A science and design partnership: Developing a middle school curriculum about scientific modeling*. Talk given at the University of California at Berkeley, Berkeley, CA.
- Schwarz, C., White, B., & Frederiksen, J.** (1997, April). *Educational technologies and instructional approaches for scientific inquiry and modeling*. Paper presented at the American Educational Research Association, Chicago, IL.
- Schwarz, C., White, B., & Frederiksen, J.** (1997, April). *Computer microworlds and scientific inquiry: Developing students' understanding of modeling*. Paper presented at the National Association for Research in Science Teaching, Oakbrook, IL.
- White, B., Frederiksen, J. & **Schwarz, C.** (1996, April). *ThinkerTools: A curriculum for teaching scientific inquiry and modeling*. Interactive symposium presented at the meeting of the American Educational Research Association, New York, NY.
- Schwarz, C.** (1995, April). *Junior high students' conceptions and related inquiry about mass and gravity*. Poster session presented at the meeting of the American Educational Research Association, San Francisco, CA.

PROFESSIONAL SERVICE AND REVIEWING

International and National Service

National Association for Research in Science Teaching Policy
and Practice Committee, Chair 2018-2019

2016 – 2019

Science Education editorial board member

F2016 – present

- NARST International Sandra K. Abell Institute faculty mentor
Taiwan Normal University, Tapei, Taiwan June 22-26, 2017
- Reviewer for National Science Foundation Panel (8 proposals) Summer 20XX
- Reviewer for two National Science Foundation panels
and ad-hoc reviewing (17 proposals) Spr & Sum 20XX
- Reviewer for NSF panel (11 proposals) 20XX
- Operationalizing the Science and Engineering Practices Project 2014-2016
Expert panel member for a Delphi Study on Science Practices
The Horizon Research, Inc. report can be retrieved from: <http://www.horizon-research.com/operationalizing-the-science-and-engineering-practices-2>
- Associate Editor for the *Journal of Research in Science Teaching* 2010 - 2013
- National Association for Research in Science Teaching 2007-2009
Program coordinator for Strand 7 pre-service science teacher education
- Advisory Board for National Science Foundation funded project 2017
(PI: Kristen Wendell & Tejaswini Dalvi, Tufts University)
“ConnecTions in the Making: Elementary students, teachers, and
STEM professionals integrating science and engineering to design
community solutions)”
- Advisory Board for National Science Foundation funded project 2015 - 2017
(PI: Dan Damelin, Concord Consortium) “Supporting Secondary
Students in Building External Models”
- Advisory Board for National Science Foundation funded project 2016
(PI: Marcia Linn, University of California Berkeley) “Project
Learning with Automated Network Support (PLANS)”
- Advisory Board for National Science Foundation funded project 2015
(PI: Sean Smith) “Knowledge Assets to Support the Science
Instruction of Elementary Teachers (ASSET)”
- Advisory Board for National Science Foundation funded project 2013 - 2015
(PIs: Barber, Loper, & McNeill) “Constructing and Critiquing
Arguments in Middle School Science Classrooms: Supporting
Teachers with Multimedia Educative Curriculum Materials”
- Advisory Board for National Science Foundation funded project 2013
(PIs: Bransford, Bell, Shouse, Tzou & Vye) “Agency in
Sustained Problem-Based Inquiry: Learning Science Through
and As Innovation”
- Advisory Board for National Science Foundation funded project 2010-2012
(PI: Ji Shen) entitled, “Achievements and Challenges of
Modeling-based Instruction (ACMBI) in Science Education
from 1980 to 2009”
- Ad-hoc reviewer for journals including: *Educational Psychology*, *Journal of the
Learning Sciences*, *Journal of Research in Science Teaching*, *Science Education
Journal of Science Education and Technology*, *Science & Education*, *Journal of*

Teacher Education, International Journal of Science Education, Teaching and Teacher Education.

REPRESENTATIVE COLLEGE AND DEPARTMENT SERVICE

Faculty Advisory Committee, Co-chair Department of Teacher Education	2017 - present
Elementary Science Subject Area Leader Department of Teacher Education	2005/06, 2007- 2011, 2013 - present
Reappointment, Promotion and Tenure Committee Department of Teacher Education	2006-2007, F2013-Summer 2016
Art Education Faculty Search Committee, Chair Department of Teacher Education	F2016-S2017
Global Initiative Impact Faculty Search Committee College of Education	F2015–2018
Art Education Faculty Search Committee Department of Art, Art History and Design	F2016–S2017
Science Education Group Point Person (through 2/16)	F2014-S2016
Elementary Social Studies Faculty Search Committee Department of Teacher Education	F2014-S2015
Science Education Faculty Coordinator and CREATE for STEM Seminar Planning Committee	F2014–S2015
Review of Undergraduate Scholarships, Department of Teacher Education	S2013
Teacher Preparation Director Faculty search committee, co-chair Department of Teacher Education	2010-2011
Faculty Advisory Committee College of Education	2010-2011; S2013
Teacher Preparation Committee, Chair in 2009-2010 Department of Teacher Education	2008-2010
Excellence and Innovation in Teaching Award Selection Committee, College of Education	2008, 2009
Faculty Advisory Committee Department of Teacher Education	2005-2007
Teacher Preparation Academic Policy and Procedures Committee, Department of Teacher Education	2004-2005
Integrated Science Major program development	2004-2005
Science Education Search Committee, Department of Teacher Education	2004, 2006, 2008
Ph.D. Academic Policy and Procedures Committee, Department of Teacher Education	2002

REPRESENTATIVE PROFESSIONAL DEVELOPMENT, LOCAL SERVICE and COMMUNITY OUTREACH

Michigan Department of Education (MDE) Revision of Michigan Elementary Science Teacher Education Standards	February 2018 - present
Professional Development, NSTA All workshop on Science and Engineering Practices ~70 NSTA attendees Los Angeles, CA	March 2017
Professional Development, Head Start Preschool Programs Half-day workshop on “Exploring Science with Young Children” Twenty-three Head Start preschool teachers Detroit, MI	February 2016
Professional Development, MoHSES 3 rd grade teachers Two-day summer workshop on Scientific Modeling and Engaging Students in Scientific Discussions Iowa City, Iowa	May 2014
Professional Development, Scientific Practices 5 th and 6 th grade Okemos teachers Bi-weekly meetings and summer workshops Okemos, Michigan	2011-2014
Professional Development, MoHSES 3 rd grade teachers Two-day summer workshop on Scientific Modeling in the FOSS Water Unit Iowa City, Iowa	May 2013
Facilitating Effective Discussions in the University Classroom Certo, J., Halvorsen, A., & Schwarz, C., Lilly Teaching Seminar MSU Office of the Provost – Faculty and Organizational Development	February, 2010
Professional Development, MoDeLS 5 th grade Okemos & Lansing teachers Monthly meetings and summer workshops East Lansing, Michigan	2007-2010
Professional Development, PiCRUST 6 th grade Lansing teachers Bi-weekly study groups and summer learning institutes Lansing, Michigan	2002-2007
Director of the Cornell Elementary School Science Fair Okemos, Michigan	2005-2007

AWARDS AND FELLOWSHIPS

Excellence and Innovation in Teaching Award College of Education, Michigan State University	2005
Modeling and Simulation tools for K-8 Science Teaching <i>Contemporary Issues in Technology and Teacher Education's</i> Gallery of Exemplary Practices in the Use of Technology to Teach Content in a Methods Course: http://www.citejournal.org/vol5/iss1/general/article5.cfm	2005
National Science Foundation Science and Design Fellowship	1996-97
Evelyn Lois Corey Graduate Fellowship, University of California at Berkeley	1996
School of Education Regents Fellowship, University of California at Berkeley	1995

COURSES TAUGHT AT MSU*Undergraduate*

- TE 401 Teaching subject matter to diverse learners: Elementary science methods
 TE 402 Crafting teaching practice: Elementary science methods
 SME/ISE 301 Science for elementary schools
 SME/ISE 420 Science research for elementary schools

Internship

- TE 501 Internship in teaching diverse learners I
 TE 502 Internship in teaching diverse learners II

Masters

- TE 804 Reflection and inquiry in teaching practice II
 TE 860B Inquiry and the nature of science (on-line)

Doctoral

- CEP 930 Educational Inquiry
 TE 936 Science Learning and Implications for Teaching and Teacher Education
 TE 994 Laboratory and field experience in curriculum, teaching, and education policy for elementary science teacher educators
 TE 955 Contemporary issues in science curriculum and teaching: Science learning and development
 TE 991A Special topics in science education: Teaching and learning science with technology

DOCTORAL ADVISEES OR DISSERTATION CHAIR

- Christa Haverly, Department of Teacher Education (anticipated graduation 2020)
 Li Ke, Department of Teacher Education (anticipated graduation 2018)
 Rachel Larimore, Department of Teacher Education (anticipated graduation, 2022)
 Meenakshi Sharma, Department of Teacher Education (anticipated graduation 2018)
 Hamin Baek, Department of Teacher Education (graduated in 2013); Handong International School, South Korea
 Jamie Mikeska, Department of Teacher Education (graduated in 2010); Educational Testing Service
 Minjung Bae, Department of Counseling, Educational Psychology, and Special Education (graduated in 2009); South Korea

DOCTORAL COMMITTEES (other than advisees)

- Elizabeth Boltz, Department of Counseling, Educational Psychology, and Special Education (anticipated graduation, 2019)
 Tina Vo, University of Nebraska (anticipated graduation, 2018)
 Joshua Rosenberg, Department of Counseling, Educational Psychology, and Special Education (anticipated graduation, 2018)
 May Lee, Department of Teacher Education (anticipated graduation, 2018)
 Dawnmarie Ezzo, Department of Teacher Education (anticipated graduation, 2018)
 Abraham Lo, Northwestern University (defended 8/17, graduated 2017)
 Kristin Mayer, Department of Teacher Education (defended 6/16; graduated 2016)
 Laura Zangori, University of Nebraska (defended 4/15; graduated in 2015), University of Missouri.

Mete Akcaoglu, Department of Counseling, Educational Psychology, and Special Education (graduated in 2013), University of Southern Georgia
Stephanie Strachen, Department of Teacher Education (on committee in 2013 only for proposal defense)
Hosun Kang, Department of Teacher Education (graduated in 2011), University of California at Irvine
Jing Chen, Department of Teacher Education (graduated in 2011), Educational Testing Service
Gel Alvarado, Department of Fisheries & Wildlife (graduated in 2010)
Kristin Gunckel, Department of Teacher Education (graduated in 2008)
Jody Galosy, Department of Teacher Education (graduated in 2005)

GUIDANCE COMMITTEES (other than advisees or doctoral committees):

Molly Barrett, Department of Teacher Education
Erin Bronstein, Department of Teacher Education
Chris Klager, Department of Educational Administration, Policy
Youngjun Lee, Department of Counseling, Educational Psychology, and Special Education, MQM
Christie Morrison Thomas, Department of Teacher Education
Peter Nelson, Department of Teacher Education
Cory Savino, Department of Educational Administration/Higher Education
Kraig Wray, Department of Teacher Education
Zhan, Li, Department of Teacher Education (withdrew in 2013)

DOCTORAL STUDENT AND POSTDOCTORAL STUDENT CO-AUTHORS (other than advisees, doctoral committees, and guidance committees)

Hayat Hokayem (graduated in 2012) Texas Christian University
Yovita Gwekwerere (graduated in 2006) Laurentian University
Ajay Sharma (graduated in 2006) University of Georgia

WORK WITH DOCTORAL STUDENT RESEARCH AND TEACHING ASSISTANTS (other than advisees, doctoral committees, guidance committees, and co-authors)

Steve Bennett, TA for TE403 Fall 2015, TE804 Spring 2016
Elizabeth Xeng de los Santos, RA for NRSS project 2014-2015; TA for TE403 Fall 2015; TE804 Spring 2016
Day Greenberg, TA for TE403 Fall 2016
Katie Schenkel, TA for TE403 Fall 2016, 2017
Hannah Miller, TA for TE403 and TE804 during 2014-2015
LeighAnn Tomaswick, RA for NRSS project 2013-2014
Sarah Stapleton, TA for TE403 and TE804 during 2013-2014

POSTDOCTORAL MENTOR

Dr. Andrea Bierema, postdoctoral fellow for “*Developing Tools to Elicit and Analyze Scientific Modeling Practices*” grant; Michigan State University, 2014 – 2016

FACULTY MENTOR

Dr. Shana Cinquemani, Assistant Professor, Michigan State University, 2017 - present
Dr. David Stroupe, Assistant Professor, Michigan State University, 2013 – present

Dr. Bethany Wilinski, Assistant Professor, Michigan State University 2014 – present

ADDITIONAL TEACHING EXPERIENCE

Guest teacher in collaborating Scientific Practices 6 th grade classrooms for seven lessons in the IQWST 6 th grade chemistry unit, Kinawa 5-6 school, Okemos, MI	Fall 2013
Co-teacher and teacher aide in ThinkerTools 7 th grade classrooms Willard Middle School, Berkeley, CA, Montera Middle School, Oakland, CA	1/94 – 6/97
Graduate Student Instructor Introduction to Astronomy, University of California at Berkeley, Berkeley, CA	9/93 – 12/93
Teaching Assistant, High School Astronomy Thacher School Summer Science Program, Ojai, CA	Summer 1992
Teaching Intern, High School Astronomy Massachusetts Advanced Studies Program, MA	Summer 1990