

MIKE STIEFF, PH.D.

PROFESSOR OF LEARNING SCIENCES, PSYCHOLOGY, & CHEMISTRY
UNIVERSITY OF ILLINOIS-CHICAGO
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RESEARCH INTERESTS

Design-based research, educational technology, curriculum development, visualization, embodied cognition, science identity development, expertise, individual and sex differences, chemistry education

ADMINISTRATIVE APPOINTMENTS

UNIVERSITY OF ILLINOIS, CHICAGO	CHICAGO, IL
Director of Undergraduate Studies, Chemistry	Jan 2018 – present
Master Teaching Scholar, UIC Center for Teaching & Learning Communities	Aug 2015 – Aug 2016
Faculty Fellow, Vice Provost for Undergraduate Affairs	Aug 2013 – Aug 2014

ACADEMIC APPOINTMENTS

UNIVERSITY OF ILLINOIS, CHICAGO	CHICAGO, IL
Professor, Learning Sciences/Chemistry/Psychology	Aug 2018 – present
Associate Professor, Learning Sciences/Chemistry/Psychology	Aug 2013 – Aug 2018
Assistant Professor, Learning Sciences/Chemistry	Aug 2010 – Aug 2013
LEIBNIZ-INSTITUT FÜR WISSENSMEDIEN	TÜBINGEN, GERMANY
Humboldt Fellow/Visiting Research Scientist	Mar 2016 – Nov 2016
UNIVERSITY OF MARYLAND, COLLEGE PARK	COLLEGE PARK, MD
Assistant Professor, Teaching, Learning, Policy, & Leadership	Aug 2006 – Aug 2010
UNIVERSITY OF CALIFORNIA, DAVIS	DAVIS, CA
Assistant Professor, Learning & Mind Sciences	Aug 2004 – Aug 2006
HAROLD WASHINGTON COLLEGE	CHICAGO, IL
Chemistry Lecturer, Department of Physical Science	Sep 2003 – Jun 2004
NORTHWESTERN UNIVERSITY	EVANSTON, IL
Chemistry Teacher, Center for Talent Development	Jun 2002 – Aug 2003

EDUCATION

NORTHWESTERN UNIVERSITY	EVANSTON, IL
Ph.D., Learning Sciences	Jun 2004
Certificate, Cognitive Science	Jun 2003
M.S., Chemistry	Jun 2000
DICKINSON COLLEGE	CARLISLE, PA
B.S., Chemistry, Latin (Minor), Magna Cum Laude	Jun 1998
INTERCOLLEGIATE CENTER FOR CLASSICAL STUDIES	ROME, ITALY
Latin and Classical Studies	Feb 1997 - May 1997

AWARDS & HONORS

HUMBOLDT FELLOWSHIP FOR EXPERIENCED RESEARCHERS
 ACS EDITORS' CHOICE ARTICLE (JOURNAL OF CHEMICAL EDUCATION)
 UIC TEACHING RECOGNITION AWARD
 CSCL BEST DESIGN PAPER AWARD (NOMINEE)
 BEST PAPER 6TH INTERNATIONAL CONFERENCE ON DIAGRAMS
 ICLS BEST STUDENT PAPER AWARD (NOMINEE W/ DR. LAURA CATHCART)
 SPENCER DISSERTATION YEAR FELLOWSHIP FOR RESEARCH RELATED TO EDUCATION
 NORTHWESTERN UNIVERSITY DISSERTATION YEAR FELLOWSHIP AWARD
 NORTHWESTERN UNIVERSITY GRADUATE RESEARCH AWARD
 NORTHWESTERN COGNITIVE SCIENCE FELLOW
 HORACE E. ROGERS AWARD, POTENTIAL IN THE FIELD OF CHEMISTRY
 C.V. STARR SCHOLARSHIP, ACADEMIC EXCELLENCE IN CLASSICS
 MARY DICKINSON SCHOLARSHIP, OVERALL ACADEMIC EXCELLENCE
 AMERICAN CHEMICAL SOCIETY'S OUTSTANDING CHEMISTRY MAJOR AWARD
 PHI BETA KAPPA

RESEARCH FUNDING

PENDING SUPPORT

CENTER FOR THE ADVANCEMENT THE DEVELOPMENT OF EDUCATION TECHNOLOGIES INIT. 2020
 U.S. Dept. of Education (IES), \$9,972,303, Principal Investigator
 Establish research center to study the prevalence of online learning technologies in U.S. higher education institutions, develop process to support collaborations between software developers and education researchers, and create faculty professional development program that supports blended instruction.

IMPROVING STUDENT SUCCESS THROUGH CULTURALLY RESPONSE TEACHING INIT. 2020
 National Science Foundation (HSI-IUSE), \$2,491,555, Principal Investigator
 Create and evaluate the efficacy of a faculty professional development program that supports the development and implementation of CRT modules into STEM gateway courses.

MOBILIZING VISUALIZATION INIT. 2020
 National Science Foundation, \$297,081, Principal Investigator
 Create augmented reality software application that embeds dynamic visualizations of chemical phenomena into the college laboratory experience.

CURRENT SUPPORT

BUILDING INCLUSIVE EXCELLENCE IN STEM AT UIC 2018 – 2022
 Howard Hughes Medical Institute, \$1,000,000, Co-Principal Investigator (#091631-00001)
 Implement and evaluate student success initiatives to improve representation and retention of minoritized students in undergraduate STEM degree programs.

EFFICACY OF THE CONNECTED CHEMISTRY CURRICULUM 2017 – 2022
 U.S. Dept. of Education (IES), \$3,285,840, Principal Investigator (R305A170074)
 Create and evaluate the efficacy of comprehensive computer-based curriculum for improving learning, student achievement, and pedagogy in high school chemistry classrooms.

VISUAL & PERCEPTUAL COMPONENTS OF SPATIAL THINKING IN STEM 2017 – 2020
National Science Foundation, \$496,793, Principal Investigator (DRL-1661096)
Characterize the cognitive strategies that allow expert chemists and high-spatial ability students to encode and retrieve visual-spatial information on rapid timescales.

SCIENCE EDUCATION FOR EXCELLENCE AND EQUITY IN CHICAGO (SEEEC) 2014 – 2020
National Science Foundation, \$1,539,985, Co-Principal Investigator (DUE-1439761)
Recruit and prepare new highly qualified science teaching fellows for CPS high schools while building the capacity of master teaching fellows to be leaders in CPS and urban science education.

COMPLETED SUPPORT

INTERN: GRADUATE STUDENT SBIR INTERNSHIP 2018
National Science Foundation, \$43,632, Principal Investigator
Fund internship for graduate student to collaborate with small business concern on the development of new visualization technologies for undergraduate chemistry instruction.

ENRICHING THE GENERAL CHEMISTRY LABORATORY EXPERIENCE 2013 – 2015
WITH PEDAGOGICAL SIMULATIONS
National Science Foundation, \$199,959, Principal Investigator (DUE-1244489)
Create and evaluate the efficacy of comprehensive computer-based curriculum for improving learning, student achievement, and pedagogy in undergraduate chemistry classrooms.

REPRESENTATION TRANSLATION WITH MODELS IN CHEMISTRY 2010 – 2013
National Science Foundation, \$446,583, Principal Investigator (DRL-1102349)
Identify the cognitive mechanisms that are supported by concrete manipulatives during problem solving in undergraduate science, specifically organic chemistry.

THE CONNECTED CHEMISTRY CURRICULUM 2010 – 2013
U.S. Dept. of Education (IES), \$1,121,093, Principal Investigator (R305A100992)
Create and evaluate the efficacy of comprehensive computer-based curriculum for improving learning, student achievement, and pedagogy in high school chemistry classrooms.

ALTERNATIVE STRATEGIES FOR PROBLEM SOLVING IN SCIENCE 2007 – 2012
National Science Foundation, \$688,178, Principal Investigator (DRL-490222)
Examine strategy choice and application by undergraduate students and faculty in introductory chemistry. Design novel pedagogy based on strategy choice and evaluate effectiveness for improving achievement.

PEDAGOGICAL EXPERTS IN EDUCATION TECHNOLOGY FOR TEACHING SCIENCE II 2010 – 2011
Maryland Higher Education Commission, \$185,793, Principal Investigator (ITQ-10-814)
Expand educational technology professional development program into Baltimore City Public Schools. Train teachers in using inquiry curricula and evaluate scalability of technology-based interventions.

ASSESSING THE RELATIONSHIP BETWEEN SPATIAL ABILITIES AND 2008 – 2009
PARTICIPATION IN COLLEGE SCIENCE
National Science Foundation, \$60,000, Co-Principal Investigator
Correlate spatial ability, gender, dropout rates and achievement in undergraduate science.

DISCIPLINARY EXPERTS IN SCIENCE EDUCATION RESEARCH 2007 – 2009
National Science Foundation, \$1,311,074, Co-Principal Investigator (DRL-0733613)
Develop novel doctoral programs to improve the preparation of science education researchers.

GENDER-SPECIFIC STRATEGIES FOR PROBLEM SOLVING IN SCIENCE 2007
University of Maryland General Research Board, \$9,550, Principal Investigator
Examine sex differences in problem solving strategy choice in undergraduate organic chemistry.

- CREATING COGNITIVE DISSONANCE IN A COMPUTER GAME ENVIRONMENT 2007 – 2009
National Science Foundation Seed Grant, \$6,000, Principal Investigator
Investigate conceptual change in undergraduate physics via virtual gaming environments.
- PEDAGOGICAL EXPERTS IN EDUCATION TECHNOLOGY FOR TEACHING SCIENCE 2009 – 2010
Maryland Higher Education Commission, \$191,377, Principal Investigator (ITQ-09-708)
Develop and administer professional development program for Prince George’s County Public Schools.
Support teachers in the use of new technology-infused lessons.
- STUDENT VIEW OF VISUALIZATION: WHAT DO THEY SEE? 2004-2005
National Science Foundation Seed Grant, \$5,000, Co-Principal Investigator
Designed and conducted protocol analyses for eye-tracking studies of student problem solving in
advanced chemistry via Flash animations and molecular modeling software.
- INCORPORATING SIMULATIONS AND MODELING IN GENERAL CHEMISTRY 2004-2006
The Camille & Henry Dreyfus Foundation, \$78,032, Principal Investigator (SG-05-083)
Directed work circle team of researchers and teachers to develop simulation-based curriculum activities
for high school chemistry. Implemented activities to assess learning outcomes with curriculum activities.
- ADDRESSING MISCONCEPTIONS IN CLIMATE CHANGE THROUGH VISUALIZATION 2004-2006
National Science Foundation Seed Grant, \$5,000, Principal Investigator
Designed misconceptions inventory regarding climate and change. Assessed conceptual change in seventh
grade students who learn climatology via NASA visualization images.
- KNOWLEDGE REPRESENTATION AND MANIPULATION IN ORGANIC CHEMISTRY 2002-2004
The Spencer Foundation, \$40,000, Principal Investigator
Collected and analyzed field observations, psychometrics, achievement assessments, and clinical
interviews for 200 students to discriminate diagrammatic and spatial reasoning in college chemistry.

PUBLICATIONS & PRESENTATIONS

PEER-REVIEWED JOURNALS & PROCEEDINGS

(*primary author, †student co-author)

1. *Chen, Y., Yim, R., *Kogen, R., Superfine, A., & Stieff, M. (forthcoming). Rethinking rater effects when using teacher observation protocols. *Manuscript accepted for publication in the Proceedings of the 14th International Conference of the Learning Sciences (ICLS) 2020*. Nashville, TN.
2. *DeSutter, D. & Stieff, M. (forthcoming). Designing for spatial thinking in STEM: Embodying perspective shifts does not lead to improvements in imagined operations. *Manuscript accepted for publication in the Proceedings of the 14th International Conference of the Learning Sciences (ICLS) 2020*. Nashville, TN.
3. *Atit, K., Uttal, D., & Stieff, M. (forthcoming). Rethinking the spatial nature of spatial thinking in STEM. *Manuscript accepted for publication in Cognitive Research: Principles & Implications*.
4. *Stieff, M., Werner, S., DeSutter, D., Franconeri, S., & Hegarty, M. (forthcoming). Visual chunking as a strategy for spatial thinking in STEM. *Manuscript accepted for publication in Cognitive Research: Principles & Implications*.
5. *Stieff, M., & DeSutter, D. Drawing predicts learning independent of representational competence. *Manuscript under revision to Journal of Research in Science Teaching*.
6. *Scopelitis, S., & Stieff, M. Disciplining perception for spatial thinking: A performative approach. *Manuscript under revision to Discourse Processes*.
7. *Meyerhoff, H. S., Jardine, N., Stieff, M., Hegarty, M., & Franconeri, S. (2019). Visual ZIP files: Mental rotation overcomes capacity limits by compressing objects. *Journal of Vision, 19*(10), 134.

8. *Ryan, S., & Stieff, M. (2019). Drawing for assessing learning outcomes in chemistry. *Journal of Chemical Education*, 96(9), 1813-1820.
9. *Stieff, M. (2019). Improving learning outcomes in secondary chemistry with visualization-supported inquiry activities. *Journal of Chemical Education*, 96(7), 1300-1307.
10. *Stieff, M., Werner, S., Fink, B., & Meador, D. (2018). Online pre-laboratory videos improve student learning in the general chemistry laboratory. *Journal of Chemical Education*, 95(8), 1260-1266.
11. *Stieff, M., †Origenes, A., †DeSutter, D., †Lira, M., †Gabel, G., & †Banevicius, L. (2018). Operational constraints on the mental rotation of STEM diagrams. *Journal of Educational Psychology*, 110(8), 1160-1174.
12. *Stieff, M., Scheiter, K., Ainsworth, S., Bohrmann-Linder, C., & †Schall, M. (2018). Drawing for learning from dynamic visualizations in science. In J. Kay, & R. Luckin (Eds.), *Rethinking Learning in the Digital Age, Making the Learning Sciences Count, 13th International Conference of the Learning Sciences (ICLS) 2018, Vol. 2* (pp. 937-940). London: International Society of the Learning Sciences.
13. *Cooper, M., Stieff, M., & †DeSutter, D. (2017). Sketching the invisible to predict the visible: From drawing to modeling in chemistry. *Topics in Cognitive Science*, 9(4), 902-920.
14. *†DeSutter, D., & Stieff, M. (2017). Teaching students to think spatially through embodied actions: design principles for learning environments in STEM. *Cognitive Research: Principles and Implications*, 2(1), 1-22.
15. *†DeSutter, D., & Stieff, M. (2016). Embodied actions to support spatial thinking in STEM: Structural diagrams in organic chemistry. In C. K. Looi, J. L. Polman, U. Cress, P. & Reimann (Eds.), *Transforming Learning, Empowering Learners: The International Conference of the Learning Sciences (ICLS) 2016, Vol. 2* (pp. 1233-1234). Singapore: International Society of the Learning Sciences.
16. *Ainsworth, S., Stieff, M., †DeSutter, D., Tytler, T., Prain, V., Panagiotopoulos, D., Wigmore, P., van Joolingen, W., Heijnes, J., Leenaars, F., & Puntambekar, S. (2016). Exploring the value of drawing in learning and assessment. In C. K. Looi, J. L. Polman, U. Cress, P. & Reimann (Eds.), *Transforming Learning, Empowering Learners: The International Conference of the Learning Sciences (ICLS) 2016, Vol. 2* (pp. 1149-1151). Singapore: International Society of the Learning Sciences.
17. *Stieff, M., & Superfine, A. C. (2016). Reforming the undergraduate STEM classroom experience. In C. K. Looi, J. L. Polman, U. Cress, P. & Reimann (Eds.), *Transforming Learning, Empowering Learners: The International Conference of the Learning Sciences (ICLS) 2016, Vol. 2* (pp. 1149-1151). Singapore: International Society of the Learning Sciences.
18. *Stieff, M., †Lira, M., & Scopelitis, S. A. (2016). Gesture supports spatial thinking in STEM. *Cognition & Instruction*, 34(2), 80-99.
19. *Stieff, M., Scopelitis, S. A., †Lira, M., & †DeSutter, D. (2016). Improving representational competence in organic chemistry with concrete models. *Science Education*, 100(2), 344-363.
20. *Stieff, M., & Uttal, D. (2015). How much can spatial training improve STEM achievement? *Educational Psychology Review*, 27(4), 607-615.
21. Stieff, M. (2015). Supporting the teaching and learning of chemistry with the Connected Chemistry Curriculum. *Spectrum*, 40(3), 1.
22. *Stieff, M., †Lira, M., & †DeSutter, D. (2014). Representational competence & spatial thinking in STEM. *Proceedings of the 12th International Conference of the Learning Sciences (ICLS 2014)* (pp. 987-991). ISLS: Boulder, CO.
23. *†DeSutter, D., & Stieff, M. (2014). Taking a new perspective on spatial representations in STEM. *Proceedings of the 12th International Conference of the Learning Sciences (ICLS 2014)* (pp. 1599-1600). ISLS: Boulder, CO.
24. *Stieff, M., Dixon, B. L., †Ryu, M., Kumi, B., & Hegarty, M. (2014). Strategy training eliminates sex differences in STEM spatial problem solving. *Journal of Educational Psychology*, 106(2), 390-402.
25. *Stieff, M., †Yip, J., & †Ryu, M. (2013). Speaking across levels—Teacher and student discourse practices in the chemistry classroom. *Chemistry Education Research & Practice*, 14(4), 376-389.

26. *Stieff, M. (2013). Sex differences in the mental rotation of chemistry representations. *Journal of Chemical Education*, 90(2), 165-170.
27. *Ryan, S., †Yip, J., Stieff, M., & Druin, A. (2013). Cooperative inquiry as a community of practice. In N. Rummel, M. Kapur, M. Nathan, & S. Puntambekar (Eds.), *Proceedings of the 10th International Conference on Computer-Supported Collaborative Learning* (pp. 145-148). Madison, WI: International Society for the Learning Sciences.
28. *Hegarty, M., Stieff, M., & Dixon, B. L. (2013). Cognitive change in mental models with experience in the domain of organic chemistry. *Journal of Cognitive Psychology*, 25(2), 220-228.
29. *Stull, A. T., Hegarty, M., Dixon, B. L., & Stieff, M. (2012). Use it or lose it: Representational translation with concrete models. *Cognition & Instruction*, 30(4), 404-434.
30. *Scopelitis, S. A., & Stieff, M. (2012). Weaving together parts to achieve a whole: Gestural activity for the coordination of information in the teaching and learning of chemistry. In J. van Aalst, K. Thompson, M.J. Jacobson, & P. Reimann (Eds.), *The Future of Learning: Proceedings of the 10th International Conference of the Learning Sciences (ICLS 2012) – Volume 2* (pp. 406-411). ISLS: Sydney, NSW, AUSTRALIA.
31. *†Lira, M., Stieff, M., & Scopelitis, S. A. (2012). The role of gesture in solving spatial problems in STEM. In J. van Aalst, K. Thompson, M.J. Jacobson, & P. Reimann (Eds.), *The Future of Learning: Proceedings of the 10th International Conference of the Learning Sciences (ICLS 2012) – Volume 2* (pp. 539-541). ISLS: Sydney, NSW, AUSTRALIA.
32. *Stieff, M., †Ryu, M., Dixon, B. L., & Hegarty, M. (2012). Problem solving strategies used by organic chemistry undergraduates. *Journal of Chemical Education*, 89(7), 854-859.
33. *Newcombe, N., & Stieff, M. (2012). Six myths about spatial thinking. *International Journal of Science Education*, 34(6), 955-971.
34. Stieff, M. (2011). Fostering representational competence through argumentation with multi-representational displays. *Proceedings of the 9th International Conference on Computer-Supported Collaborative Learning* (Vol. 1, pp. 288-295). Mahwah, NJ: Erlbaum.
35. Stieff, M. (2011). Improving representational competence using multi-representational learning environments. *Journal of Research in Science Teaching*, 48(10), 1137-1158.
36. Stieff, M. (2011). When is a molecule three-dimensional? A task-specific role for imagistic reasoning in advanced chemistry. *Science Education*, 95(2), 310-336.
37. *Stieff, M., Hegarty, M., & Deslongchamps, G. (2011). Identifying representational competence with multi-representational displays. *Cognition & Instruction*, 29(1), 123-145.
38. *Stieff, M., Hegarty, M., & Dixon, B. L. (2010). Alternative strategies for spatial reasoning with diagrams. In A. K. Goel, M. Jamnik, N. H. Narayanan (Eds.), *Diagrammatic Representation and Inference*. (pp. 115-127). Berlin: Springer.
39. *Stull, A. T., Hegarty, M., Stieff, M., & Dixon, B. L. (2010). Does manipulating molecular models promote representation translation of diagrams in chemistry? In A. K. Goel, M. Jamnik, N. H. Narayanan (Eds.), *Diagrammatic Representation and Inference*. (pp. 338-344). Berlin: Springer.
40. *Stieff, M., †Ryu, M., & Dixon, B. L. (2010). Students' use of multiple strategies for scientific problem solving. In K. Gomez, L. Lyons & J. Radinsky (Eds.), *Proceedings of the Ninth International Conference of the Learning Sciences (ICLS)* (Vol. 1, pp. 765-772). Mahwah, NJ: Erlbaum.
41. *†Cathcart, L., Stieff, M., Marbach-Ad, G., Smith, A., & Frauwirth, K. (2010). Using Knowledge Space Theory to analyze concept maps in an undergraduate immunology course. *Proceedings of the Ninth International Conference of the Learning Sciences (ICLS)* (Vol. 1., pp. 952-959). Mahwah, NJ: Erlbaum.
42. *Stieff, M., & Raje, S. (2010). Expert algorithmic and imagistic problem solving strategies in advanced chemistry. *Spatial Cognition & Computation*. 10(1), 53-81.
43. *Stieff, M., & †Raje, S. (2008). Expertise and spatial reasoning in advanced scientific problem solving. *Proceedings of the Eighth International Conference of the Learning Sciences (ICLS)*, pp. 366-373). Mahwah, NJ: Erlbaum.

44. Stieff, M. (2007). Mental rotation and diagrammatic reasoning in science. *Learning and Instruction*, 17(2), 219-234.
45. *Stieff, M., & *McCombs, M. (2006). Increasing representational fluency with visualization tools. *Proceedings of the Seventh International Conference of the Learning Sciences (ICLS)* (Vol.1, pp. 730-736). Mahwah, NJ: Erlbaum.
46. Stieff, M. (2005). Visualization and diagrammatic reasoning in genuine scientific problem solving. In T. Barkowsky, C. Freksa, M. Hegarty, & R. Lowe (Eds.), *Reasoning with mental and external diagrams: computation modeling and spatial assistance* (AAAI Tech. Rep. SS-05-06, pp. 121-126). Menlo Park, CA: AAAI Press.
47. Stieff, M. (2005). Connected Chemistry—A novel modeling environment for the chemistry classroom. *Journal of Chemical Education*, 82(3), 489-493.
48. *Stieff, M., & Wilensky, U. (2003). Connected Chemistry—Incorporating interactive simulations into the chemistry classroom. *Journal of Science Education & Technology*, 12(3), 285-302.
49. *Sherin, B., Kanter, D., Schwarz, J., Stieff, M., Herman, P., & Mackenzie, S. (2002). Conceptual dynamics in project-based science. In P. Bell, R. Stevens, & T. Satwicz (Eds.), *Keeping Learning Complex: The Proceedings of the Fifth International Conference of the Learning Sciences (ICLS)* (pp. 429-436). Mahwah, NJ: Erlbaum.
50. *Stieff, M., & Wilensky, U. (2002). ChemLogo: An emergent modeling environment for teaching and learning chemistry. In P. Bell, R. Stevens, & T. Satwicz (Eds.), *Keeping Learning Complex: The Proceedings of the Fifth International Conference of the Learning Sciences (ICLS)* (pp. 451-458). Mahwah, NJ: Erlbaum.
51. *Crouch, R. D., Stieff, M., Frie, J. L., Cadwallader, A. B., & Bevis, D. C. (1999). Selective deprotection of silyl-protected phenols using solid NaOH and a phase transfer catalyst. *Tetrahedron Letters*, 40, 3133-3136.

BOOKS & BOOK CHAPTERS

1. **Lira, M., & Stieff, M. (2018). Using gesture analysis to assess students' developing representational competence. In K. Daniel (Ed.), *Towards a Framework for Representational Competence in Science Education*, (pp. 205-228). Champaign, IL: Spring.
2. *Stieff, M. (2017). Increasing student engagement with visualizations through drawing. In R. Lowe & R. Plötzner (Eds.), *Learning from Dynamic Visualizations: Innovations in Research and Application* (pp. 333-356). New York: Springer.
3. *Stieff, M., & Ryan, S. A. (2016). Designing the Connected Chemistry Curriculum. In V. Svilha, & R. Reeve (Eds.), *Design as Scholarship in the Learning Sciences: Cases from the Learning Sciences* (pp. 110-114). New York: Routledge.
4. *Hegarty, M., Stieff, M., & Dixon, B. (2015). Reasoning with diagrams: towards a broad ontology of spatial thinking strategies. In D. Montello, K. Grossner, & D. G. Janelle (Eds.), *Space in Mind: Concepts for Spatial Learning and Education* (pp. 75-98). Boston: MIT.
5. *Stieff, M., & Ryan, S. (2013). Explanatory models for the research and development of chemistry visualizations. In J. Suits & M. Sanger (Eds.), *Pedagogic Roles of Animations and Simulations in Chemistry Courses* (pp. 15-41). ACS Books; Mahwah, NJ.
6. *Stieff, M., Nighelli, T., Yip, J., Ryan, S., & Berry, A. (2012). *The Connected Chemistry Curriculum (Vols. 1-9)*. University of Illinois: Chicago.
7. Stieff, M., Bateman, R., & Uttal, D. (2005). Teaching and learning with three-dimensional representations. In J. K. Gilbert (Ed.), *Visualization in science education* (pp. 93-120). Oxford: Oxford University Press.

INVITED COLLOQUIA

1. Stieff, M. (2018, November). *Facilitating learning in organic chemistry with concrete & virtual molecular representations*. Invited lecture presented at University of Nebraska, Department of Chemistry. Lincoln, NE.
2. Stieff, M. (2018, June). *Spatial thinking is multimodal*. Invited lecture presented at Leibniz-Institut für Wissensmedien Summer School: Multimodality & Knowledge Processes. Tübingen, Germany.
3. Stieff, M. (2018, March). *Spatial & Diagrammatic Reasoning in Chemistry*. Invited lecture presented at University of California-San Diego, Department of Chemistry. San Diego, CA.
4. Stieff, M. (2017, November). *Spatial ability as a predictor of STEM performance*. Invited lecture presented at the 12th International Symposium of Cognition, Logic and Communication, University of Latvia. Riga, Latvia.
5. Stieff, M. (2017, May). *Pedagogical tools for improving spatial thinking in STEM*. Invited lecture presented at Leibniz-Institut für Wissensmedien. Tübingen, Germany.
6. Stieff, M. (2016, December). *Now you see it, now you don't: Pedagogical tools for improving visual literacy*. Invited lecture presented at Michigan State University, College of Education. East Lansing, MI.
7. Stieff, M. (2015, November). *Cognitive interventions for improving spatial thinking in science*. Invited lecture presented at University of California-Los Angeles, Department of Chemistry. Los Angeles, CA.
8. Stieff, M. (2015, October). *Cognitive interventions for improving spatial thinking in science*. Invited lecture presented at Loyola University, Department of Chemistry. Chicago, IL.
9. Stieff, M. (2015, October). *Cognitive interventions for improving spatial thinking in science*. Invited lecture presented at University of South Florida, Department of Chemistry. Tampa, FL.
10. Stieff, M. (2015, April). *Cognitive interventions for training spatial thinking in college chemistry*. Invited lecture presented at North Park University, Department of Chemistry. Chicago, IL.
11. Stieff, M. (2014, November). *Facilitating learning in organic chemistry with concrete and virtual molecular representations*. Invited lecture presented at University of Iowa, Department of Chemistry. Iowa City, IA.
12. Stieff, M. (2014, September). *Cognitive interventions for training spatial thinking in college STEM courses*. Invited lecture presented at Miami University, Department of Chemistry. Oxford, OH.
13. Stieff, M. (2014, April). *Cognitive interventions for training spatial thinking in organic chemistry*. Invited lecture presented at Michigan State University, Department of Chemistry. East Lansing, MI.
14. Stieff, M. (2014, April). *Explorations in representational competence with the Connected Chemistry Curriculum*. Invited lecture presented at Michigan State University, College of Education. East Lansing, MI.
15. Stieff, M. (2013, November). *Improving spatial reasoning in STEM disciplines via strategy training and concrete manipulatives*. Invited lecture presented at University of Chicago, Department of Psychology, Chicago, IL.
16. Stieff, M. (2013, September). *Improving representational competence in organic chemistry with concrete molecular models*. Invited lecture presented at Purdue University, Department of Chemistry. West Lafayette, IN.
17. Stieff, M. (2013, July). *Using design-based research to develop and study novel learning environments*. Invited lecture presented at Hong Kong University, College of Education. Hong Kong, Hong Kong.
18. Stieff, M. (2013, July). *Implementing quasi-experimental designs in real world settings*. Invited lecture presented at Hong Kong University, College of Education. Hong Kong, Hong Kong.
19. Stieff, M. (2013, April). *Eye-tracking methods for identifying representational competence in chemistry*. Invited Lecture presented at Michigan State University, CREATE for STEM Eye-Tracking Conference. East Lansing, MI.
20. Stieff, M. (2013, March). *Instructional models for improving undergraduate chemistry achievement*. Invited Lecture presented at University of New Hampshire, Department of Chemistry. Durham, NH.

21. Stieff, M. (2013, March). *Spatial reasoning & organic chemistry problem solving*. Invited Lecture presented at Oakland University, Department of Chemistry. Rochester, MI.
22. Stieff, M. (2013, March). *Instructional models for improving the achievement of women in undergraduate chemistry*. Invited lecture presented at Temple University, Institute for Learning and Education Sciences. Philadelphia, PA.
23. Stieff, M. (2012, December). *Spatial thinking in chemistry*. Invited Lecture presented at the University of California, Santa Barbara, Spatial Thinking Across the College Curriculum Workshop. Santa Barbara, CA.
24. Stieff, M. (2011, November). *Explorations into representational competence with the Connected Chemistry Curriculum*. Invited Lecture presented at the Northwestern University Learning Sciences Brown Bag. Evanston, IL.
25. Stieff, M. (2011, February). *Visualization technologies for teaching chemistry*. Invited talk presented in Learning Sciences Practicum in Learning Environment Design. Northwestern University, Evanston, IL.
26. Stieff, M. (2010, November). *Sex differences in strategy use for spatial problem solving*. Invited lecture presented at University of Illinois, Department of Psychology Cognitive Psychology Brown Bag, Chicago, IL.
27. Stieff, M. (2010, March). *Careers in science education*. Invited lecture presented at University of Maryland, Department of Chemistry, College Park, MD.
28. Stieff, M. (2010, February). *Spatial & diagrammatic reasoning in scientific problem solving*. Invited lecture presented at University of Illinois, Institute for Learning Sciences, Chicago, IL.
29. Stieff, M. (2010, February). *The affordances of technology-infused learning environments in STEM classrooms*. Invited lecture presented at the University of Maryland, College of Information Studies, College Park, MD.
30. Stieff, M. (2010, February). *What makes a methodology?* Invited panelist for College of Education Graduate Student Association Brown Bag, University of Maryland, College of Education, College Park, MD.
31. Stieff, M. (2010, January). *Chalk Talk: The future of science, technology, engineering, and mathematics education*. Invited panelist at the University of Maryland, College of Education, College Park, MD.
32. Stieff, M. (2009, November). *Characterizing student problem solving strategies in undergraduate chemistry*. Invited lecture presented at Clemson University, Department of Chemistry, Clemson, SC.
33. Stieff, M. (2009, November). *Multi-method designs for identifying spatial thinking in scientific problem solving*. Invited lecture presented at University of Chicago, Department of Psychology, Chicago, IL.
34. Stieff, M. (2009, May). *Understanding teacher & student problem solving strategies in college science*. Invited lecture presented at the EDCI Research Colloquium, University of Maryland, Department of Curriculum & Instruction, College Park, MD.
35. Stieff, M. (2007, November). *Imagistic and diagrammatic reasoning in science*. Invited lecture presented at Purdue University, Department of Chemistry, West Lafayette, IN.
36. Stieff, M. (2007, October). *Visualization & diagrammatic reasoning in undergraduate chemistry*. Invited lecture presented at University of Maryland, Department of Chemistry, College Park, MD.
37. Stieff, M. (2007, February). *Imagistic and diagrammatic reasoning in science*. Invited lecture presented at Reed College, Department of Chemistry, Portland, OR.
38. Stieff, M. (2004, November). *Implementing and assessing interactive simulations for chemistry*. Invited lecture presented at American River College, Department of Chemistry, Sacramento, CA.
39. Stieff, M. (2003, June). *Imagery and problem solving in advanced science*. Invited lecture presented at the Annual Meeting of the Cognitive Science Program, Northwestern University, Evanston, IL.

CONFERENCE PRESENTATIONS

1. Stieff, M. (2020, December, forthcoming). *Simulations & animations for teaching dynamic processes*. In G. Lawrie (Chair), Symposium on *Supporting and Assessing Student Learning using Digital Technologies*. Paper presented at Pacificchem2020. Honolulu, HI.
2. Stieff, M. (2020, March, forthcoming). *Improving learning outcomes in secondary chemistry with visualization-supported inquiry activities*. Paper presented at the Spring 2020 Meeting of the American Chemical Society. Philadelphia, PA.
3. Thakral, C., & Stieff, M. (2019, November). *UIC-Lessons Learned*. In G. Langford (Chair), Symposium on *STEM Higher Education Reform: Lessons Learned from a Peer Implementation Cluster*. Paper presented at the AACU Transforming STEM Higher Education Conference. Chicago, IL.
4. Meyerhoff, H. S., Jardine, N., Stieff, M., Hegarty, M., & Franconeri, S. (2019, May). *Visual ZIP files: Mental rotation overcomes capacity limits by compressing objects*. Paper presented at the Vision Sciences Society Annual Meeting. St. Pete Beach, FL.
5. Stieff, M. (2019, April). *Designing the Connected Chemistry Curriculum*. In C. Chhin (Chair), Symposium on *Improving Science Teaching and Learning through Rigorous and Relevant Education Technology Interventions*. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching. Baltimore, MD
6. Gunlap, P., Rathbun, Z., Meyerhoff, H., Stieff, M., Franconeri, S., & Hegarty, M. (2018, November). *Working memory for complex objects: Effects of explicit stimulus regularity*. Poster presented at the 59th Annual Meeting of the Psychonomic Society. New Orleans, LA.
7. Jardine, N., Franconeri, S., Szuba, A., DeSutter, D., Stieff, M., Gunlap, P., Rathbun, Z., Hegarty, M., & Meyerhoff, H. (2018, September). *Re-evaluating the cognitive capacities and processes underlying visuospatial thinking in chemistry*. Poster presented at 2018 CIRCLE Conference. St. Louis, MO.
8. Stieff, M., Hegarty, M., Franconeri, S., Werner, S., DeSutter, D., Gunlap, P., Rathbun, Z., Jardine, N., Meyerhoff, H. (2018, September). *Mechanisms of visuospatial thinking in STEM*. Poster presented at Spatial Cognition 2018. Tübingen, Germany.
9. Stieff, M., Scheiter, K., Ainsworth, S., Bohrmann-Linder, C., †Schall, M. (2018). *Drawing for learning from dynamic visualizations in science*. Paper presented at the 13th International Conference of the Learning Sciences. London, UK.
10. Stieff, M., Scheiter, K., Ainsworth, S., Borhmann-Linde, C. (2017, October). *Sketching for learning from dynamic visualizations*. Poster presented at the Network Meeting of the Alexander von Humboldt Foundation. Bielefeld, Germany.
11. Stieff, M., & DeSutter, D. (2017, September). *Supporting learning about molecular structure through embodied actions*. In N. S. Newcomb (Chair), Symposium on *Applications of Embodied Cognition to STEM Education*. Paper presented at the 20th European Society for Cognitive Psychology Conference (ESCoP). Potsdam, Germany.
12. Stieff, M. (2017, August). *Improving spatial thinking in STEM through representational competence*. In M. Hegarty (Chair), Symposium on *Educating Spatial Thinking for STEM Success*. Paper presented at the 2016 Annual Meeting of the Cognitive Science Society. London, UK.
13. Hegarty, M., Stull, A. T., & Stieff, M. (2016, August) *Fostering spatial intelligence in organic chemistry*. Paper presented at the 2016 Annual Meeting of the Cognitive Science Society. Philadelphia, PA.
14. DeSutter, D., & Stieff, M. (2016, June). *Embodied actions to support spatial thinking in STEM: structural diagrams in organic chemistry*. Poster presented at the 12th International Conference of the Learning Sciences (ICLS 2016). Singapore.
15. Stieff, M., & DeSutter, D. (2016, June). *Drawing from dynamic visualizations*. In S. Ainsworth (Chair), Symposium on *Exploring the Value of Drawing in Learning and Assessment*. Paper presented at the 12th International Conference of the Learning Sciences (ICLS 2016). Singapore.

16. Stieff, M., & Superfine, A. C. (2016, June). *Reforming the undergraduate STEM classroom experience*. Poster presented at the 12th International Conference of the Learning Sciences (ICLS 2016). Singapore.
17. Ryan, S. A., & Stieff, M. (2016, March). *Connected Chemistry Curriculum and the Next Generation Science Standards*. Paper presented at the 250th Meeting of the American Chemical Society. San Diego, CA.
18. Stieff, M. (2015, September). *Spatial thinking in chemistry*. Paper presented at Integrating Cognitive Science with Innovative Teaching in STEM. Evanston, IL.
19. Ryan, S., & Stieff, M. (2015, March). *Efficacy of the Connected Chemistry Curriculum*. Paper presented at the 249th Meeting of the American Chemical Society. Denver, CO.
20. Stieff, M. (2015, February). *Spatial thinking & representational competence in chemistry*. Paper presented at the 2015 AAAS Annual Meeting. San Jose, CA.
21. Stieff, M., & Villa, J. (2014, November). *The Connected Chemistry Curriculum*. Virtual Conference for the American Association for Chemistry Teachers.
22. Ping, R., Goldin-Meadow, S. & Stieff, M. (2014, July). *Gestures reflect and shape knowledge in complex organic chemistry tasks*. Paper presented at the International Society for Gesture Studies Conference. San Diego, CA.
23. Stieff, M., Lira, M., & DeSutter, D. (2014, June). *Representational competence & spatial thinking in STEM*. Paper presented at the 11th International Conference of the Learning Sciences (ICLS 2014). Boulder, CO.
24. DeSutter, D., & Stieff, M. (2014, June). *Taking a new perspective on spatial representations in STEM*. Poster presented at the 11th International Conference of the Learning Sciences (ICLS 2014). Boulder, CO.
25. Stieff, M. (2014, May). *Sketching & spatial thinking in the chemical sciences*. Paper presented at the Sketching & Education Workshop, Northwestern University. Evanston, IL.
26. Stieff, M., DeSutter, D., & Lira, M. (2014, March). *The Connected Chemistry Curriculum*. In S. Goldman (Chair), Presidential Invited Session: *Changing the Game: Research Innovations and the Interdisciplinary Development of Technologies for Learning*. Paper presented at the American Educational Research Association. Philadelphia, PA.
27. Stieff, M., & Ryan, S. (2013, September). *Developing multi-modal assessments of student learning in technology-infused environments*. SREE Fall 2013 Conference "Interdisciplinary Synthesis in Advancing Education Science. Washington, DC.
28. Stieff, M., & Newcombe, N. (2013, August). *Six myths about spatial thinking*. Paper presented at the 2013 Meeting of the European Science Education Research Association. Nicosia, Cyprus.
29. DeSutter, D., & Stieff, M. (2013, July). *Using head tracking to address representational competence in organic chemistry*. Poster presented at the 2013 Gordon Research Conference on Visualization in Science and Education. Smithfield, RI.
30. Stieff, M., & Storksdieck, M. (2013, July). *Assessment workshop*. Workshop conducted at the 2013 Gordon Research Conference on Visualization in Science & Education, Smithfield, RI.
31. Ryan, S., Yip, J., Stieff, M., & Druin, A. (2013, June). *Cooperative inquiry as a community of practice*. Paper presented at the 10th International Conference on Computer-Supported Collaborative Learning. Madison, WI.
32. Ryan, S. A. C., & Stieff, M. (2013, March). *Using multiple modalities simultaneously as an assessment tool for learning from visualizations*. Paper presented at the 245th Annual Meeting of the American Chemical Society. New Orleans, LA.
33. Stieff, M., & Scopelitis, S. A. (2012, July). *Orchestrating knowledge building: Gestural activity for the coordination of information for the teaching and learning of chemistry*. Paper presented at the Fifth Conference of the International Society for Gesture Studies. Lund, Sweden.
34. Lira, M., & Stieff, M. (2012, May). *Action for thought: How STEM students use depictive models to evaluate the accuracy of their solutions during problem solving*. Poster presented at the Midwest Cognitive Science Conference (MWCogSci). Bloomington, IN.

35. Lira, M., & Stieff, M. (2012, July). *Spacing out and in: How STEM students' uses of depictive models during spatial problem solving reveal developing representational competence*. Poster presented at the Conference of the International Society for the Psychology of Science and Technology (ISPST). Pittsburg, PA.
36. Scopelitis, S. A., & Stieff, M. (2012, July). *Weaving together parts to achieve a whole: Gestural activity for the coordination of information in the teaching and learning of chemistry*. Poster presented at the 10th International Conference of the Learning Sciences (ICLS). Sydney, Australia.
37. Lira, M., Stieff, M., & Scopelitis, S. A. (2012, July). *The role of gesture in solving spatial problems in STEM*. Paper presented at the 10th International Conference of the Learning Sciences (ICLS). Sydney, Australia.
38. Ryan, S., & Stieff, M. (2012, August). *Student drawings as an assessment tool for learning from visualizations*. Paper presented at the 2012 Biennial Conference on Chemical Education. State College, Pennsylvania.
39. Lira, M., & Stieff, M. (2012, May). *Action for thought: How STEM students' use models to evaluate the accuracy of their solutions during problem solving*. Poster presented at the Midwest Cognitive Science Conference. Bloomington, IN.
40. Yip, J., Ryu, M. & Stieff, M. (2012, April). *Speaking across levels – generating & addressing levels confusion in discourse*. Paper presented at the American Educational Research Association. Vancouver, BC.
41. Stieff, M. (2012, April). *Sex differences in strategy use for spatial problem solving in chemistry*. In A. Stull (Chair), *Spatial Thinking in Chemistry*. Symposium presented at the American Educational Research Association. New Orleans, LA.
42. Lira, M., Stieff, M., Scopelitis, S. A., & Schroeder, L. (2012, April). *The role of gesture in solving spatial problems in STEM*. Poster presented at the American Educational Research Association. Vancouver, BC.
43. Stieff, M. (2011, August). *Fostering representation competence with molecular-level simulations & animations*. Invited paper presented at the 242nd Annual Meeting of the American Chemical Society. Denver, CO.
44. Stieff, M. (2011, July). *Fostering representational competence through argumentation with multi-representational displays*. Paper presented at the 9th International Conference on Computer-Supported Collaborative Learning. Hong Kong, China.
45. Ryan, S., & Yip, J., Nighelli, T., & Stieff, M. (2011, June). *Using participatory design to develop visualization for learning*. Poster presented at the 2011 Gordon Research Conference on Visualization in Science and Education. Smithfield, RI.
46. Dang, T., Berry, A., & Stieff, M. (2011, June). *The Connected Chemistry Curriculum (ConnChem): Computer-based chemistry simulations*. Poster presented at the 2011 Gordon Research Conference on Visualization in Science and Education. Smithfield, RI.
47. Stieff, M. (2011, June). *Reasoning with molecular diagrams in the mind and in the world*. Invited plenary lecture presented at the 2011 Gordon Research Conference on Chemistry Education Research & Practice. Davidson, NC.
48. Stieff, M., & Ryan, S. (2011, May). *Developing and implementing inquiry activities for teaching science with visualizations*. Chicago Symposium on Excellence in Teaching Mathematics and Science: Research and Practice. Chicago, IL.
49. Yip, J. C., Jaber, L. Z., & Stieff, M. (2011, April). *Examining changes in students' coordination of verbal and pictorial chemical representations in response to instruction*. Paper presented at the American Educational Research Association. New Orleans, LA.
50. Stieff, M. (2011, April). *Mediating sex differences in science achievement with analytical heuristics*. In A. Jaeger (Chair), *Learning with Spatial, Embedded and Embodied Representations*. Symposium presented at the American Educational Research Association. New Orleans, LA.

51. Stieff, M., Dixon, B. L., Ryu, M., Clover, B., & Hegarty, M. (2011, April). *Training selective strategy use for spatial problem solving in science*. Paper presented at the American Educational Research Association. New Orleans, LA.
52. Stull, A. T., Hegarty, M., Dixon, B. L., & Stieff, M. (2011, April). *Chemistry models: facilitating cognition through external manipulatives*. Poster presented at the American Educational Research Association. New Orleans, LA.
53. Stieff, M. (2011, March). *Representational competence in multi-representational molecular animations*. Invited paper presented at the Annual Meeting of the American Chemical Society. Anaheim, CA.
54. Stull, A. T., Hegarty, M., Stieff, M., & Dixon, B. L. (2010, November). *Individual differences in use of external representations in spatial thinking*. Paper presented at the Annual Meeting of the Psychonomics Society. St. Louis, MO.
55. Stull, A. T., Hegarty, M., Stieff, M., & Dixon, B. L. (2010, August). *Concrete models as aids to representational translation of molecular diagrams*. Paper presented at the 2010 Meeting of the Cognitive Science Society. Portland, OR.
56. Stieff, M., Hegarty, M., & Dixon, B. L. (2010, August). *Alternative strategies for spatial reasoning with diagrams*. Paper presented at Diagrams 2010. Portland, OR.
57. Ryu, M., & Stieff, M. (2010, May). *Students' use of multiple strategies for spatial thinking in chemistry*. Paper presented at the Annual Meeting of the American Educational Research Association, Denver, CO.
58. Yip, J., & Stieff, M. (2010, May). *Examining teacher decision-making during enactments of novel technology-infused curricula*. Paper presented at the Annual Meeting of the American Educational Research Association, Denver, CO.
59. Cathcart, L., Stieff, M., Marbach-Ad, G., Smith, A., & Frauwirth, K. (2010, March). *Using Knowledge Space Theory to analyze concept maps*. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (NARST), Philadelphia, PA.
60. Stieff, M. (2010, March). *Alternative strategies for problem solving in science*. Invited lecture presented at the Annual REESE PI Meeting of Center for Advancing Research & Communication. Pentagon City, VA.
61. Raje, S., & Stieff, M. (2009, August). *Role of spatial reasoning in advanced chemistry problem-solving*. Paper presented at ChemEd2009, Radford, VA.
62. Ryu, M., & Stieff, M. (2009, August). *University faculty's perceptions on visuo-spatial reasoning and success in science*. Paper presented at ChemEd2009, Radford, VA.
63. Stieff, M., Storksdieck, M., & Geelan, D. (2009, July). *Assessment workshop*. Workshop conducted at the Gordon Research Conference on Visualization in Science & Education, Oxford, UK.
64. Stieff, M. (2009, May). *Task-specificity of spatial thinking in advanced scientific problem solving*. Invited lecture presented at the Conference on Spatial Thinking in Education, Evanston, IL.
65. Cathcart, L.A., Marbach-Ad, G., Smith, A.C., Stieff, M., & Frauwirth, K.A. (2009, May). *Concept Mapping as a Teaching and Assessment Tool in an Undergraduate Immunology Course*. Poster session presented at the American Society for Microbiology Conference for Undergraduate Educators, Fort Collins, CO.
66. Stieff, M., Ryu, M., & Yip, J. (April, 2009). *Speaking across levels-teacher & student perspectives of chemistry*. Paper presented at the Annual Meeting of the American Educational Research Association, San Diego, CA.
67. Garvin, M., & Stieff, M. (2009, April). *Identity, power & curriculum modifications in teacher-research collaborations*. Paper presented at the Annual Meeting of the American Educational Research Association, San Diego, CA.
68. Raje, S., & Stieff, M. (2009, April). *An examination of the cognitive mechanisms underlying chemistry misconceptions*. Paper presented at the Annual Meeting of the American Educational Research Association, San Diego, CA.

69. Stieff, M., Hegarty, M., & Dixon, B. L. (2009, February). *Alternative strategies for problem solving in science*. Poster presented at the Annual REESE PI Meeting of Center for Advancing Research & Communication, Washington, D.C.
70. Hegarty, M., & Stieff, M. (2008, February). *Assessing the relationship between spatial abilities and participation in college science*. Invited poster presented at the Spatial Intelligence and Learning Center Virtual Conference, Chicago, IL.
71. Stieff, M. (2008, January). *SIMS: Simulations & modeling in science*. Invited lecture presented at the Regional Educators Annual Chemistry Teaching Symposium (REACTS). University of Maryland Department of Chemistry, College Park, MD.
72. Stieff, M., & Hegarty, M. (2007, October). *Assessing the relationship between spatial abilities and participation in college science*. Invited poster presented at the NSF Science of Learning Centers Awardees' Meeting, Arlington, VA.
73. Stieff, M. (2007, September). *Visual literacy in science education*. Invited lecture presented at the University of Maryland Center for Teaching Excellence, College Park, MD.
74. Stieff, M. (2007, July). *Alternative strategies for problem solving with visual representations*. Invited plenary talk presented at the Gordon Research Conference on Visualization in Science & Education, Smithfield, RI.
75. Stieff, M., Ainsworth, S., & Geelan, D. (2007, July). *Assessment workshop*. Workshop conducted at the Gordon Research Conference on Visualization in Science & Education, Smithfield, RI.
76. Stieff, M. (2007, April). Barriers to problem solving with simultaneous displays of multiple dynamic representations. In M. Stieff (Chair), *Teaching and learning with external representations in math and science*. Symposium conducted at the Annual Meeting of the American Educational Research Association, Chicago, IL.
77. Stieff, M. (2007, September). Visual literacy in science education. In S. Benson (Chair), *Why Don't My Students See What I See? Visual Literacy in Undergraduate Studies*. Workshop presented at the UMD Center for Teaching Excellence, College Park, MD.
78. Stieff, M. (2006, September). *Designing effective assessments*. In M. Shultz (Chair), *Future Directions for Visualizations in Science and Education*. Workshop at National Science Foundation, Arlington, VA.
79. Stieff, M. (2005, July). *Assessing visualization tools*. In M. Stieff (Chair), *Assessment Workshop*. Workshop conducted at the Gordon Research Conference on Visualization in Science & Education, Oxford, UK.
80. Stieff, M. (2005, July). *Visualization as a problem solving strategy in chemistry*. Poster session presented at the 2005 Gordon Research Conference on Visualization in Science & Education, Oxford, UK.
81. Stieff, M. (2005, April). Dichotomous use of external representations in science learning. In O. Parnafes (Chair), *Meaning making with representations: contrasting perspectives*. Symposium conducted at the Annual Meeting of the American Educational Research Association, Montreal, QC.
82. Stieff, M. (2005, April). *A theoretical framework for integrating cognitive ability and domain knowledge in science learning*. Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, QC.
83. Stieff, M. (2004, July). *Targeting visualization use in organic chemistry*. Paper presented at the Eighteenth Biennial Conference on Chemical Education, Ames, IA.
84. Stieff, M., Stillings, N., Arasasingham, R., Taagepera, M., & Wamsler, C. (2004, April). *Characterizing chemistry problem solving with convergent approaches from chemistry, education, and psychology*. Paper presented at the National Association for Research in Science Teaching, Vancouver, BC.
85. Stieff, M. (2003, September). *Problem solving strategies in undergraduate organic chemistry*. Paper presented at the American Chemical Society National Meeting, New York, NY.

86. Stieff, M., Sherin, B., & Uttal, D. (2003, July). *Mental imagery and problem solving in organic chemistry*. Poster session presented at the Gordon Conference on Visualization in Science & Education, Oxford, UK.
87. Stieff, M. (2003, March). *Incorporating interactive simulations into the chemistry classroom*. Paper presented at Chicago Symposium Series on Excellence in Teaching Mathematics and Science: Research and Practice, Chicago, IL.
88. Stieff, M., & Wilensky, U. (2002, June). *Modeling chemistry as an emergent phenomenon*. Poster session presented at the Gordon Conference on Innovations in College Chemistry Teaching, New London, CT.
89. Sherin, B., Kanter, D., Schwarz, J., & Stieff, M. (2002, April). *A framework for capturing conceptual dynamics in complex science interventions*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.
90. Stieff, M., & Wilensky, U. (2001, June). *Connected Mathematics: Making sense of complex phenomena through building object-based parallel models*. Poster session presented at the National Education Computing Conference, Chicago, IL.
91. Wilensky, U., & Stieff, M. (2001, June). *Modeling complex systems with multi-agent logics*. Workshop presented for Logosium 2001 at the National Education Computing Conference, Chicago, IL.

TEACHING EXPERIENCE

EDUCATION & LEARNING SCIENCES

Learning Sciences Research Seminar (doctoral)
 Writing in the Social Sciences (doctoral)
 Research Methods in Science Education (doctoral)
 Design of Learning Environments (doctoral)
 Computers in Education (doctoral)
 Epistemologies of Educational Research (doctoral)
 Research Trends in Science Education (doctoral)
 Problem Solving In & Out of Schools (doctoral)
 Research Methods in Science Education (doctoral)
 Psychology of School Learning (doctoral)
 Introduction to Educational Psychology (undergraduate)

CHEMISTRY

Chemistry Teaching Assistant Professional Development (doctoral)
 Organic Chemistry (undergraduate)
 BenchChem-General Chemistry (undergraduate)
 Honors Chemistry (secondary)
 Fundamentals of Chemistry (primary)

PROFESSIONAL & SERVICE ACTIVITIES

SERVICE TO THE FIELD

GORDON CONFERENCE ON VISUALIZATION IN SCIENCE & EDUCATION

Organizing Committee, co-Chair	2015 – 2017
Organizing Committee, co-Vice Chair	2013 – 2015
Gordon Conference Workshop Committee, Chair	2005 – 2013

JOURNAL OF THE LEARNING SCIENCES
Editorial Board, Member 2014 – present

JOURNAL OF RESEARCH IN SCIENCE TEACHING
Editorial Board, Associate Editor 2012 – 2015

NATIONAL ACADEMIES OF SCIENCE
Committee on Communicating Chemistry to the Public, Member 2013 – 2015

CHICAGO SYMPOSIUM SERIES ON EXCELLENCE IN TEACHING MATHEMATICS AND SCIENCE
ORGANIZING COMMITTEE, MEMBER 2012 – 2013

AMERICAN EDUCATIONAL RESEARCH ASSOCIATION
Executive Committee (SIG-LS, SIG-ALT), Treasurer 2010 – 2012

NATIONAL ASSOCIATION FOR RESEARCH IN SCIENCE TEACHING
NARST Outstanding Paper Review Committee, Reviewer 2006

NORTHERN CALIFORNIA SCIENCE EDUCATION SYMPOSIUM
NCSSES Organizing Committee, Chair 2006

SCIENTIFIC ADVISORY BOARDS
 “Supporting conceptual learning in chemistry with multiple graphical representations in an intelligent tutoring system” PI: Martin Rau, UW-Wisconsin
 “Empirical Research – Fostering Problem Solving Transfer using Concrete and Virtual Models in Chemistry” PI: Mary Hegarty, UC-Berkeley
 “Optimizing learning from chemistry simulations: Comparing attention allocation and learning outcomes for assignments with and without instructor screencasts” PI: Deborah Herrington, Grand Valley State University
 “In Touch with Molecules: Extending Learning with Cyber-enabled Tangibles” PI: Jodi Davenport, WestEd
 “Bootstrapping Achievement and Motivation in STEM: An Integrated Cognitive-Motivational Intervention to Improve Biology Grades” PI: Jennifer Cromley, UIUC
 “Effects of Diagrams and Spatial Skills on Undergraduate Students' Illusions of Understanding of Introductory Biology and Geoscience Texts” PI: Jennifer Wiley, UIC

AD-HOC REVIEWER
 Science Magazine
 Cognitive Science
 Science Education
 Cognition & Instruction
 Learning & Instruction
 Journal of Chemical Education
 Journal of the Learning Sciences
 Journal of Engineering Education
 Technology, Knowledge and Learning
 Chemistry Education Research & Practice
 International Journal of Science Education
 Cognitive Research: Principles & Implications
 Annual Meeting of the Cognitive Science Society
 International Conference for the Learning Sciences
 Annual Meeting of the American Educational Research Association
 National Science Foundation (REESE, ISE & DRK-12 Programs; Panel Chair)

UNIVERSITY SERVICE**OFFICE OF THE PROVOST, UIC**

Student Success Initiative Adaptive Courseware Team, co-Chair	2015 – 2017
Council for Excellence In Teaching & Learning, Member	2014 – 2016
Targeted First-Year Curriculum Task Force, Co-Chair	2013 – 2014

UIC UNIVERSITY SENATE, UIC

Senate Faculty Affairs Committee, Member	2015 – 2017
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COLLEGE OF LIBERAL ARTS & SCIENCES (LAS), UIC

LAS Educational Policy Committee, Member	2018 – present
LAS MSLC Advisory Committee, Member	2018 – 2019
Math & Science Learning Center Director Search Committee, Member	2017 – 2018
Department of Chemistry Advisory Committee to Head, Member	2014 – 2017
LAS Calculus Reform Committee, Member	2014
Department of Psychology Cognitive Faculty Search Committee, Member	2013 – 2014
Department of Chemistry Teaching Labs Committee, Member	2011 – 2012
Department of Chemistry General Chemistry Committee, Member	2011 – 2012

LEARNING SCIENCES RESEARCH INSTITUTE, UIC

LSRI Director Search Committee, Member	2019 – 2020
LSRI Associate Director Search Committee, Member	2019 – 2020
LSRI-Chemistry Faculty Search Committee, Chair	2018 – 2019
LSRI Advisory Committee, Member	2014 – 2016

UIC HONORS COLLEGE, UIC

Honors College Research Grant Committee, Member	2010 – 2011
Honors College Admissions, Reviewer	2010 – 2011

COLLEGE OF EDUCATION, UM-COLLEGE PARK

EDCI Advisory Board, Member	2007 – 2010
EDCI Promising Researcher Fellowship Committee, , Member	2007 – 2009
College of Education Academic Senate, Member	2006 – 2008
College of Education Strategic Web Development Team, Member	2006 – 2008
Gemstone Program, Evaluator	2007 – 2008

SCHOOL OF EDUCATION, UC-DAVIS

Seminar Series Committee, Chair	2005 – 2006
Policy Committee, Chair	2005 – 2006
Academic Planning Council, Science Education Representative	2005 – 2006
Undergraduate Council, Member	2005 – 2006
Nanoscience & Nanotechnology Steering Committee, Member	2004 – 2006
Educational Testing & Measurement Search Committee, Member	2004 – 2005

PROFESSIONAL MEMBERSHIPS

American Chemical Society, Division of Chemical Education, Member
 American Educational Research Association, Member
 International Society of the Learning Sciences, Member
 National Association for Research in Science Teaching, Member

THESIS & POST-DOCTORAL ADVISEES**POST-DOCTORAL ADVISEES**

Dr. Sonali Raje, Ph.D. (Associate Professor of Chemistry Education, Towson University)
Dr. Stephanie Ryan, Ph.D. (CEO, Ryan Education Consulting)
Dr. Bryna Kumi, Ph.D. (Adjunct Professor, Rowan University)
Dr. Stephanie Scopelitis, Ph.D. (Dean of Students, Culver Academies)

DOCTORAL ADVISEES

Ms. Mirlanda Prudent, University of Illinois-Chicago (LSRI, exp. defense Dec. 2020)
Ms. Stephanie Werner, University of Illinois-Chicago (CER, exp. defense Apr. 2021)
Ms. Anna Szuba, University of Illinois-Chicago (CER, exp. defense Apr. 2021)
Dr. Dane DeSutter, University of Illinois-Chicago (Post-doctoral Researcher, University of Illinois-Chicago)
Dr. Matthew Lira, Ph.D. (2016), University of Illinois-Chicago (LSRI) (Clinical Assistant Professor, University of Iowa)
Dr. Jason Yip, Ph.D. (2014), University of Maryland, College Park (Assistant Professor of Information Studies, University of Washington)
Dr. Megean Garvin, Ph.D. (2012) University of Maryland, College Park (Program Specialist, Maryland State Department of Education)
Dr. Minjung Ryu, Ph.D. (2012) University of Maryland, College Park (Assistant Professor of Science Education, Purdue University)

MASTERS ADVISEES

Dr. Laura Cathcart, Ph.D. (2010), University of Maryland, College Park (Training Specialist, Centers for Disease Control)
Dr. Jeffery Olimpo, Ph.D. (2010), University of Maryland, College Park (Assistant Professor of Biological Sciences, UT-El Paso)
Dr. Comfort Ateh, Ph.D. (2006), University of California, Davis (Associate Professor of Science Education, Providence College)