Thomas A. Holme
Doctor of Philosophy in Chemistry

Personal Data:

Home Address: 2517 Sherwood Ave, Ames, IA 50010
Work Address: Department of Chemistry; Iowa State University, Ames, IA, 50011
Computer Address: taholme@iastate.edu
Work Phone: 515 - 294 – 9025
Birth date: July 18, 1961; Green Bay, Wisconsin

Education:

Rice University, Houston, Texas; August 1983 - March 1987
Doctor of Philosophy in Chemistry

Loras College, Dubuque, Iowa; August 1979 - May 1983
Bachelor of Science in Chemistry and Physics - *Magna Cum Laude*

Honors and Awards:

National & Regional Awards:
ACS Career Achievement in Green Chemistry Education Award, 2026
ACS-CES Award for Incorporation of Sustainability into Chemical Education, 2024
Outstanding Service Award, Division of Chemical Education, American Chemical Society, 2017
Pimentel Award – (Chemical Education) American Chemical Society, April 2017
James Flack Norris Award for Chemistry Education, Northeastern Section of the ACS, 2016
Fellow, American Association for the Advancement of Science, 2011
Fellow, American Chemical Society, 2011
Helen M. Free Award for Public Outreach, American Chemical Society, 1999

Local Teaching Awards:
Margaret Ellen White Graduate Faculty Award, Iowa State University, 2021
Cassling Award for Outstanding Achievement in Teaching, Liberal Arts and Sciences, Iowa State University, 2014
Iowa State University Award for Distinguished Undergraduate Teaching, 2014
Louis Thompson Distinguished Undergraduate Teaching Award, University-wide award, Iowa State University, 2014
Liberal Arts and Sciences Award for Teaching in Introductory Courses, Iowa State University, 2013
Distinguished Teaching Award, University of Wisconsin-Milwaukee, 1998
Belbas-Larson Award for Excellence in Teaching, University of South Dakota, 1993
Fulbright Scholar, University of Zambia, 1989

Professional Affiliations:

American Association for the Advancement of Science
American Chemical Society
Sigma Xi

Professional Experience:

Editor in Chief, Journal of Chemical Education, 2020 – present
Interim Chair, Department of Chemistry, Iowa State University, 2023
Morrill Professor, Iowa State University, 2017 – present
Professor, Iowa State University, 2008 – 2017
Director, ACS Examinations Institute, 2002 – 2015
Professor and Director of General Chemistry, University of Wisconsin – Milwaukee, 2002–08
Exchange Professor, Ajou University, Suwon, South Korea, Spring 2000
Associate Professor and Director of General Chemistry, University of Wisconsin – Milwaukee, 1994 - 2002
Assistant Professor, University of South Dakota, 1989–94
Fulbright Lecturer, University of Zambia, 1989–90
Research Assistant, University of Pennsylvania, 1988–89

Funded Grant Activity (as PI or co-PI):

"Creating Text-based Automated Assistants for Laboratory and Writing Assignments in the Teaching of General Chemistry", Budget: $290,844, NSF-IUSE, 12-21-2022 – 12-21-2025

"Transforming undergraduate STEM education: Improving student persistence and motivation in large undergraduate courses through game-based learning", with Elgin Johnston (Math); Larysa Nadolny (Education) and John Pleasants (Biology), Letters & Science, Strategic Research Incubator Program, $163,594.

"Collaborative Research: Interactive Online Support for Open-ended Problem Solving Spanning Science Practices and Domain Topics", with David Yaron, Carnegie Mellon University, NSF-IUSE, 9-1-2017 – 8-31-2020, Project Budget: $550,000: Iowa State Budget: 98,343.

"Developing Augmented Reality Applications for Chemistry Laboratory", Budget: $243,014, NSF-IUSE, 9-1-2017 – 8-31-2019

"Enhancing Comparative Assessment for Chemistry with or without Standardized Testing" Collaborative Project with co-PI, David Hart, UMass-Amherst, Amherst, MA. Total Budget: $595,000, ISU Budget: $184,000, NSF-CCLI, Phase 2, 9-15-2013 – 8-31-2017.

"Electronic Delivery of Scaffolded Visualization Tutuorials and Assessment in Chemistry", Budget: $172,759, NSF-CCLI (type 1). 9-15-2013 – 8-31-2017.

"Visualizing the Chemistry of Climate Change", with co-PI Peter Mehaffay, Kings University College, Edmonton, AB; co-PI Marcy Towns, Purdue University, West Lafayette, IN, Role: Evaluator. ISU Budget: $42,000, NSF-CLLI, Phase 2, 9-1-2010 through 8-31-2013.

"Needs Assessment of Chemistry Instructors for Educational Measurement Professional Development Materials." with Kristen Murphy, University of Wisconsin – Milwaukee, NSF-CCLI: $168,872, 9-1-2009 through 8-30-2011.

"Collaborative Research: A Data-Driven Model for Chemistry Education Reform" (lead PI) with Stacey Bretz, Univ. of Miami, Melanie Cooper, Clemson, Jennifer Lewis, Univ. of South Florida, Norbert Pienta, Univ. of Iowa, Ron Stevens, IMMEX, Marcy Towns, Purdue, Project Budget: $499,860: Iowa State Budget: 310,000 9-15-2008 through 3-14-2012

"Collaborative Research: Electronic Delivery and Criterion Referencing of Assessment Materials in Chemistry" (lead PI) with Dave Hart, UMass Amherst and John Moore, UW-Madison, Project budget: $499,881: UWM Budget: $199,997 9-15-2007 through 1-31-2012

"Using Cognitive Load Theory to Design and Assess Questions and Problem Solving Strategies in Chemistry" with Norbert Pienta (lead PI), University of Iowa and Melanie Cooper, Clemson University, National Science Foundation, CCLI Project Budget: $481,686 UWM Budget, $98,840 2006-2008

"Adapting IMMEX to Provide Problem Solving Assessment Materials from the ACS Exams Institute", Collaborative Project with Melanie Cooper, Clemson University and Ron Stevens, UCLA. National Science Foundation, CCLI Project Budget: $459,198 UWM Budget $193,323. 2005- 2007

"NUE: Nanoscience Based Supplementary Items for ACS Exams Institute Assessment Materials", National Science Foundation – Nanotechnology Undergraduate Education, 2004-2006, $100,894

"Gateway Examinations in General Chemistry for Engineers", National Science Foundation - Course and Curriculum Development, 1998-2001, $120,000.

"Chemical Toxicology for Fire Department Hazardous Materials Teams Through Distance Learning", Camille and Henry Dreyfus Foundation, 1998-1999, $25,000

National and International Professional Service: (Past 10 years)

1. **Editor in Chief**, Journal of Chemical Education, January 2020 - present

2. **Symposium Organizer,** "Incorporating Sustainability in the Chemistry Curriculum via Systems Thinking Tools" with Seamus Delaney, Peter Mahaffy, Jane Wissinger, Pacifichem, Honolulu, HI, December 2025

3. **Symposium Organizer**, "Symposium on Generative AI in Chemistry Education." National Meeting of the American Chemical Society, Denver, CO August 2024

4. **Symposium Organizer**, "Celebrating 100 Years of the Journal of Chemical Education" National Meeting of the American Chemical Society, San Francisco, CA August 2023

5. **Discussion Leader**, Gordon Conference on Chemistry Education Research and Practice, *Bates College*, July 2023

6. **Councilor**, Physical Chemistry Division of the American Chemical Society, 2021 - 2022

7. **Member**, Review Panels for the National Science Foundation, Division of Undergraduate Education, 2020, 2021, 2023, 2024, 2025

8. **Associate Editor**, Journal of Chemical Education, November 2018 - December 2019

9. **Symposium Organizer**, "Reimagining Chemistry Education Through Systems Thinking", 9th Green Chemistry and Engineering Conference, Reston, VA, June 2019.

10. **Symposium Organizer**, "Innovative Assessments in Chemistry Education" 102nd Canadian Chemistry Conference and Exhibition, Quebec City, QC, June 2019.

11. **Member**, IUPAC Project on Systems Thinking in Chemistry Education, June 2017 – Present

12. **General Chair**, 2018 Midwest Regional Meeting of the American Chemical Society, 2016 – 2018.

13. **Member**, Green Chemistry Education Roadmap Steering Committee, 2016 – 2018

14. **Discussion Leader**, Gordon Conference on Chemistry Education Research and Practice, June 2017

15. **Co-Editor**, ACS Symposium Series Book: Technology and Assessment Strategies for Improving Student Learning in Chemistry, 2015 – 2016

16. **Member**, Content Development Team, "You be the Chemist Challenge" Chemical Education Foundation, 2015 – 2018.

Summary of Scholarly Activity:

126 refereed/invited publications
- 104 in chemistry/science education
- 22 in chemistry research (theoretical/computational chemistry/systems)

5 textbooks (first, second, third, fourth and fifth edition)

1 laboratory curriculum (AP Chemistry) textbook (for teachers and students) – lead editor
2 symposium series books – lead editor
1 Chemistry Encyclopedia, Associate Editor
53 Editorials in the *Journal of Chemical Education*
27 National / International Workshops directed
64 Nationally normed chemistry exams released (secure exams are not "published")

183 contributed papers at conferences
- 132 in chemistry/science education
- 51 in chemistry research
- 24 of these research papers given by undergraduate students

309 invited presentations
- 248 in chemistry/science education
- 61 in chemistry research

Publications: (past 10 years)

1. "Exploring the Development of Chemistry Understanding from Concept Maps to SOCMEs", Micke Reynders, Thomas A. Holme, *Journal of Chemical Education*, **2026**, *ASAP*

2. "ISLAND C: A Gamified Online Homework System for Conceptual Understanding in General Chemistry", Morgan J. Clark, Thomas A. Holme, *Journal of Chemical Education*, **2026**, *103(3)*, 1641-1647.

3. "What does validating a variable representation assessment tell us about how introductory chemistry and geology students use multiple external representations?", Jack D. Polifka, Cinzia Cervato, Thomas A. Holme, *International Journal of Science Education*, 2025, ASAP DOI: 10.1080/09500693.2025.2499213

4. "SOCKit: An Online Tool for Systems Thinking", Robert MacDonald, Ashley Elgersma, Thomas Holme, Jeff Snyder, Micke Reynders, Peter Mahaffy, *Journal of Chemical Education*, **2025**, *102(7)*, 2990-2996. DOI: 10.1021/acs.jchemed.5c00310

5. *General Chemistry for Engineering Students, 5E*, Lawrence Brown and Thomas Holme, Cengage Publishing, © 2026 – published December **2024**

6. "Understanding Student Help-Seeking for Contextualizing Chemistry through Curated Chatbot Data Analysis", Annabelle T. Lolinco, Thomas A. Holme, *Journal of Chemical Education*, **2024**, *101(11)*, 4837-4846. DOI: 10.1021/acs.jchemed.4c00766

7. "Students' Experience of a ChatGPT Enabled Final Exam in a Non-Majors Chemistry Course", Morgan J. Clark, Micke Reynders, Thomas A. Holme, *Journal of Chemical Education*, **2024**, *101*, 1983-1991 DOI: 10.1021/acs.jchemed.4c00161.

8. "Developing a curated chatbot as an exploratory communication tool for chemistry learning". Annabelle Lolinco, Thomas Holme, *Journal of Chemical Education*, **2023**, *100*, 4092-4098 DOI: 10.1021/acs.jchemed.3c00520.

9. "Measuring the role of spatial ability and multiple external representations in introductory geology students' knowledge of plate tectonics". Jack D. Polifka, Cinzia Cervato, Thomas A. Holme, *Journal of Geoscience Education*, **2022**, DOI: 10.1080/10899995.2022.2135351

10. "A Systems Approach to Chemistry is Required to Achieve Sustainable Transformation of Matter: The Case of Ammonia and Reactive Nitrogen", Joesph Marc Whalen, Stephen A. Matlin, Thomas A. Holme, Jaclyn J. Stewart, Peter G. Mahaffy, *ACS Sustainable Chemistry and Engineering*, **2022**, *10(39),* 12933-12947 DOI: 10.1021/acssuschemeng.2c03159

11. "Design of a Research-Based Assessment for Children's Attitudes and Motivation at Chemistry Outreach and Museum Events", Christopher F. Bauer, Mary E. Emenike, Thomas A. Holme, *Journal of Chemical Education,* **2022**, *99*, 2821-2833 DOI: 10.1021/acs.jchemed.2c00191

12. "The Open-Response Chemistry Cognitive Assistance Tutor System: Development and Implementation", Emily C. King, Max Benson, Sandra Raysor, Thomas A. Holme, Jonathon Sewall, Kenneth R. Koedinger, Vincent Aleven, David J. Yaron, *Journal of Chemical Education,* **2022**, *99*, 546-552 DOI: 10.1021/acs.jchemed.1c00947

13. "Investigating General Chemistry Students' Ideas of the Role of Scientific Instruments", Jiwoo An, Thomas A. Holme, *Journal of Chemical Education,* **2022**, *99*, 828-838 DOI: 10.1021/acs.jchemed.1c00647

14. "Measuring the impact of incorporating systems thinking into general chemistry on affective components of student learning", Jiwoo An, Glen R. Loppnow, Thomas A. Holme, *Canadian Journal of Chemistry*, **2021,** *99 (8),* 698-705.

15. Technology, Molecular Representations, and Student Understanding of Chemistry, Jack D. Polifka, John Y. Baluyut, Thomas A. Holme, in *Problems and Problem Solving in Chemistry Education: Analyzing Data, Looking for Patterns and Making Deductions*, Ed. G. Tsaparlis, Royal Society of Chemistry, London, **2021**

16. "Evaluation of Augmented Reality Application Usage and Measuring Students' Attitudes toward Instrumentation", Jiwoo An, Thomas Holme, *Journal of Chemical Education,* **2021**, *98 (4)*, 1458-1464, DOI: 10.1021/acs.jchemed.0c01268

17. "Using the chemistry of pharmaceuticals to introduce sustainable chemistry and systems thinking in general chemistry", Thomas Holme, *Sustainable Chemistry and Pharmacy*, **2020**, *16*, 100234. doi: 10.1016/j.scp.2020.100234

18. "The American Chemical Society Exams Institute Undergraduate Chemistry Anchoring Concepts Content Map V: Analytical Chemistry, Thomas A. Holme, Christopher Bauer,

Jaclyn M. Trate, Jessica J. Reed, Jeffrey R. Raker, Kristen L. Murphy, *Journal of Chemical Education,* **2020**, *97*, 1530-1535.

19. "Adapting the Anchoring Concepts Content Map (ACCM) of ACS Exams by Incorporating a Theme: Merging Green Chemistry and Organic Chemistry", Thomas A. Holme, Jennifer MacKellar, David J.C. Constable, Olga R. Michels, Jaclyn M. Trate, Jeffrey R. Raker, Kristen L. Murphy, *Journal of Chemical Education*, **2020**, *97*, 374-382. doi: 10.1021/acs.jchemed.9b005664

20. "Usability Testing and the Development of an Augmented Reality Application for Laboratory Learning", Jiwoo An, Laila-Parvin Poly, Thomas A. Holme, *Journal of Chemical Education*, **2020**, *97*, 97-105. doi: 10.1021/acs.jchemed.9b00453

21. "Benefits to students of team-based learning in large-enrollment calculus", Travis Peters, Elgin Johnston, Heather Bolles, Craig Ogilvie, Alexis, Knaub, Thomas Holme, *PRIMUS (Problems, Resources and Issues in Mathematics Undergraduate Studies)* **2020**, *30*, 211-229. DOI: 10.1080/10511970.2018.1542417

22. "Integrating the Molecular Basis of Sustainability into General Chemistry through Systems Thinking", Peter G. Mahaffy, Stephen A. Matlin, J. Marc Whalen, Thomas A. Holme, *J. Chem. Educ*., **2019**, *96*, 2730-2741.

23. "Graphical Tools for Conceptualizing Systems Thinking in Chemistry Education", Katherine B. Aubrecht, Yehudit Judy Dori, Thomas A. Holme, Rea Lavi, Stephen A. Matlin., MaryKay Orgill, Heather Skaza-Acosta, *J. Chem. Educ*., **2019**, *96*, 2888-2900.

24. "Investigating the Content Connections of General Chemistry and Chemistry in the News", Annabelle Lolinco, Christina Kindle, Thomas Holme, in *Communication in Chemistry*, Crawford, G., Singiser, R., Kloepper, K., Myers, J, eds., ACS Symposium Series, *1327*, 215-227, **2019.**

25. "Incorporating elements of green and sustainable chemistry in general chemistry via systems thinking", Thomas Holme, in *Integrating Green and Sustainable Chemistry Principles into Education*, Dicks, A., Bastin, L. eds, Elsevier, Amsterdam, **2019,** 31-47.

26. "Ensuring That Test Takers Can Use New Chemistry Assessments Made Possible by Technology" Jack Polifka, Thomas Holme, in *Technology Integration in Chemistry Education and Research (TICER)*, eds. Gupta, T. and Belford, R.E., ACS Symposium Series, *1318* , 167-175, **2019**.

27. "Systems Thinking for Education about the Molecular Basis of Sustainability", Peter Mahaffy, Stephen A. Matlin, Thomas A. Holme, Jennifer MacKellar, *Nature Sustainability*, 2, 362-370, **2019** DOI: 10.1038/s41893-019-0285-3

28. "Systems Thinking as a Vehicle To Introduce Additional Computational Thinking Skills in General Chemistry", Thomas Holme, in, *It's Just Math: Research on Students'*

Understanding of Chemistry and Mathematics , Towns, M., H., Bain, K., Rodriguez, J-M.G. eds. ACS Symposium Series, *1316* , 239-250, **2019**

29. "Eye tracking student strategies for solving stoichiometry problems involving particulate nature of mater diagrams", John Y. Baluyut, Thomas A. Holme, *Chemistry Teacher International*, DOI: 10.1515/cti-2018-0003, **2019**

30. "Alignment of ACS Inorganic Chemistry Examination Items to the Anchoring Concepts Content Map", Keith A. Marek, Jeffrey R. Raker, Thomas A. Holme. Kristen L. Murphy, **2018**, *Journal of Chemical Education,* 95, 1468-1476.

31. "Impacts of the 2018 Division of Chemical Education Bylaw Changes on the Division's Executive Committee Composition and Work", Marcy H. Towns and Thomas A. Holme, **2018**, *Journal of Chemical Education,* 95, 1448-1450.

32. "The ACS Exams Institute Undergraduate Chemistry Anchoring Concepts Content Map III: Inorganic Chemistry", Keith A. Marek, Jeffrey R. Raker, Thomas A. Holme. Kristen L. Murphy, **2018**, *Journal of Chemical Education,* 95, 233-237 + Supplemental material DOI: 10.1021/acs.jchemed.7b00498.

33. "The ACS Exams Institute Undergraduate Chemistry Anchoring Concepts Content Map IV: Physical Chemistry", Thomas A. Holme, Jeffrey R. Raker, Kristen L. Murphy, **2018**, *Journal of Chemical Education,* 95, 238-241 + Supplemental material DOI: 10.1021/acs.jchemed.7b00531.

34. *General Chemistry for Engineering Students, 4E*, Lawrence Brown and Thomas Holme, Cengage Publishing, © 2019 – published December **2017**

35. "Comparing Student Performance Using Computer and Paper-Based Tests: Results from Two Studies in General Chemistry", Anna A. Prisacari, Thomas A. Holme, Jared Danielson, **2017**, *Journal of Chemical Education*, 94, 1822-1830, DOI: 10.1021/acs.jchemed.7b00274

36. "Beyond 'Inert' Ideas to Teaching General Chemistry from Rich Contexts: Visualizing the Chemistry of Climate Change", Peter G. Mahaffy, Thomas A. Holme, Leah Martin-Visscher, Brian E. Martin, Ashley Versprille, Mary Kirchhoff, Lallie McKenzie, Marcy Towns, **2017**, *Journal of Chemical Education*, 94, 1027-1035, DOI: 10.1021/acs.jchemed.6b01009 - ***article designated an "ACS Editors Choice"***

37. "What we don't test: What an analysis of unreleased ACS Exam items reveals about the content coverage in general chemistry assessments." Jessica Reed, Sachel Villafane, Jeffrey Raker, Thomas Holme, Kristen Murphy, **2017**, *Journal of Chemical Education*, 94, 418-428 DOI: 10.1021/acs.jchemed.6b00863

38. "Assessing Student Knowledge of Chemistry and Climate Science Concepts Associated with Climate Change: Resources to Inform Teaching and Learning", Ashley Versprille, Adam

Zabih, Thomas A. Holme, Lallie McKenzie, Peter Mahaffy, Brian Martin, Marcy Towns, **2017**, *Journal of Chemical Education*, 94, 407-417, DOI: 10.1021/acs.jchemed.6b00759

39. "How do Chemistry Educators View Items That Test Conceptual Understanding?" Cynthia Luxford, Thomas Holme, **2016**, *ACS Symposium Series*, 1235, 195-210.

40. "Using the ACS Anchoring Concepts Content Map (ACCM) To Aid in the Evaluation and Development of ACS General Chemistry Exam Items", Jessica J. Reed, Cynthia J. Luxford, Thomas A. Holme, Jeffrey L. Raker, Kristen L. Murphy, **2016**, *ACS Symposium Series*, 1235, 179-194.

41. "Analyzing the Role of Science Practices in ACS Exam Items", Jessica J. Reed, Alexandra, R. Brandriet, Thomas A. Holme, *Journal of Chemical Education*, **2017**, *94*, 3-10, DOI: 10.1021/acs.jchemed.6b00659 - ***article designated an "ACS Editors Choice"***

42. "The Division of Chemical Education Executive Committee, Board of Publication, and ACS Examinations Institute Board of Trustees: A Historical Perspective from 1985 to 2015", Marcy H. Towns, Thomas A. Holme, *Journal of Chemical Education*, **2016**, *93,*1163-1169. DOI: 10.1021/acs.jchemed.6b00050

43. "A Quantum Chemistry Concept Inventory for Physical Chemistry Classes" Marilu Dick-Perez, Cynthia J. Luxford, Theresa L. Windus, Thomas Holme, *Journal of Chemical Education*, **2016**. *93,* 605-612. DOI: 10.1021/acs.jchemed.5b00781

Other Writing/Publications: (past 10 years)

1. The Growth of Published Multisession Laboratory Experiment Articles in the Journal, Dusica Rodic, Donald Wink, Thomas Holme, Editorial *Journal of Chemical Education*, **2026**, *103(2)*, 707-708.

2. Metal-Organic Frameworks for Teaching Chemistry, Donald Wink and Thomas Holme, Editorial *Journal of Chemical Education*, **2025**, *102(12)*, 5015-5017.

3. Spices, Chemistry and the Globalization of Chemical Education, Thomas Holme, Editorial *Journal of Chemical Education*, **2025**, *102(10)*, 4193-4194.

4. Generative AI in Chemistry Education: Current Progress, Pedagogical Values, and the Challenge of Rapid Evolution, Elizabeth Yuriev, MaryKay Orgill, Thomas Holme, Editorial *Journal of Chemical Education*, **2025**, *102(9)*, 3773-3776.

5. A timely report on STEM education from the National Academy of Science, Thomas Holme, Editorial *Journal of Chemical Education*, **2025**, *102(8)*, 3087-3089.

6. A look at the Editorial Team of the Journal for 2025. Thomas Holme, Editorial *Journal of Chemical Education*, **2025**, *102(2)*, 467 - 468.

7. The Journal adds two New Manuscript Types for 2025. Thomas Holme, Editorial *Journal of Chemical Education*, **2025**, *102(1)*, 1-3.

8. Educational Implications of Artificial Intelligence-Based Chemistry and Physics Nobel Prizes. Thomas Holme, Editorial *Journal of Chemical Education*, **2024**, *101(11)*, 4533-4534.

9. The Dawn of Generative Artificial Intelligence in Chemistry Education. Elizabeth Yuriev, Donald J. Wink, Thomas A. Holme, Editorial *Journal of Chemical Education*, **2024**, *101(8)*, 2957-2959.

10. 101 Years of Chemistry Everywhere: Outreach and Chemical Education. Thomas A. Holme, Editorial *Journal of Chemical Education*, **2024**, *101(5)*, 1779-1781.

11. Does the Future Need for Batteries Present New Demands for Electrochemistry Content in General Chemistry? Thomas A. Holme, Editorial *Journal of Chemical Education*, **2024**, *101(5)*, 1777-1778.

12. Open Educational Resources Described in the Journal of Chemical Education. Thomas A. Holme, Editorial *Journal of Chemical Education*, **2024**, *101(3)*, 713-714.

13. Considering Big Questions via Chemistry Education Summits Thomas A. Holme, Editorial *Journal of Chemical Education*, **2024**, *101(1)*, 1-2.

14. A Century of a Passion for Teaching and Learning Chemistry. Thomas A. Holme, Editorial *Journal of Chemical Education*, **2023**, *100(12)*, 4567-4568.

15. Finish at the Beginning: 100 Years of High School Chemical Education. Thomas A. Holme, Editorial *Journal of Chemical Education*, **2023**, *100(11)*, 4163-4165

16. Working Together: Chemical Safety and Education. Mary Beth Mulcahy, Thomas A. Holme, Editorial *Journal of Chemical Education*, **2023**, *100(10)*, 3748.

17. Emerging Scholarship Approaches: 100 Years of Chemical Education Research. Thomas A. Holme, Editorial *Journal of Chemical Education*, **2023**, *100(10)*, 3745-3747.

18. Virtual Special Issue Call for Papers: Investigating the Uses and Impacts of Generative Artificial Intelligence in Chemistry Education. Elizabeth Yuriev, Donald J. Wink, Thomas A. Holme, Editorial *Journal of Chemical Education*, **2023**, *100(9)*, 3168-3170.

19. Chemistry, Mathematics, Physics: 100 Years of Teaching Physical Chemistry. Thomas A. Holme, Editorial *Journal of Chemical Education*, **2023**, *100(9)*, 3165-3167.

20. A Snapshot of Organic Chemistry Instruction and Curriculum over the Past 100 Years. Thomas A. Holme, Editorial *Journal of Chemical Education*, **2023**, *100(6)*, 2093-2095.

21. Inorganic Chemistry Instruction and Curriculum over the Past 100 Years. Thomas A. Holme, Editorial *Journal of Chemical Education*, **2023**, *100(6)*, 2091-2092.

22. Considering 100 Years of Instructional Innovation in Biochemistry. Thomas A. Holme, Editorial *Journal of Chemical Education*, **2023**, *100(4)*, 1411-1412.

23. Virtual Special Issue Collecting Studies of Pandemic Related Changes in Teaching and Learning Chemistry. Thomas A. Holme, Editorial *Journal of Chemical Education*, **2023**, *100(3)*, 1089-1091.

24. How to Celebrate a Century of Publishing. Thomas A. Holme, Editorial *Journal of Chemical Education*, **2023**, *100(2)*, 425-426.

25. Accelerating Change Amidst Stability. John W. Moore, Norbert J. Pienta, Thomas A. Holme, Editorial *Journal of Chemical Education*, **2023**, *100(1)*, 1-3.

26. The Tapestry of Chemistry Education. Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2022**, *99(10)*, 3353-3354.

27. On the Return of the Biennial Conference on Chemical Education. Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2022**, *99(9)*, 3087-3088.

28. Contemplating Flexibility in Chemistry Education. Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2022**, *99(7)*, 2439-2440.

29. Connecting Chemistry Education and Insects. Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2022**, *99(4)*, 1545-1546.

30. Findability, Keywords, and the Content in the Journal of Chemical Education. Judith N. Currano, Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2022**, *99(3)*, 1147-1148.

31. Can We Envision a Role for Imagination in Chemistry Learning? Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2021**, *98(12)*, 3615-3616.

32. What Role May Intuitive Concepts about Chemical Ideas Play When Students Take Timed Tests? Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2021**, *98(10)*, 3059-3060.

33. Considering the Call to Action for Science Education. Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2021**, *98 (9)*, 2739-2740.

34. Introducing Journal of Chemical Education Virtual Festschrifts. Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2021**, *98 (8)* , 2487-2489.

35. Virtual Special Issue Call for Papers: Teaching Changes and Insights Gained in the Time after COVID-19 Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2021**, *98 (7)*, 2141-2142.

36. Can the Cognitive Processes of Reading Student Evaluations Influence Their Utility? Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2021**, *98 (6)*, 1829-1830.

37. Framing Student and Faculty Stress in Education: A Proposed Science Analogy. Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2021**, *98 (5)*, 1473-1475.

38. What is Laying the Groundwork Today for the Next Big Education Revolution? Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2021**, *98 (3)*, 701-702.

39. Should Chemistry Education Be Doing More to Support the Teaching of the Central Dogma of Molecular Biology? Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2021**, *98 (2)*, 255-256.

40. Will 2020 Be an Inflection Point in the Trajectory of Chemistry Teaching and Learning? Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2020**, *97*, 4215-4216.

41. What Role Should Chemistry Education Play in Addressing Societal Trust of Applications of Chemistry?, Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2020**, *97*, 3471-3473.

42. Introduction to the Journal of Chemical Education Special Issue on Insights Gained While Teaching Chemistry in the Time of COVID-19, Thomas A. Holme, *Journal of Chemical Education*, **2020**, *97*, 2375-2377.

43. Communication and the Chemistry Education Pause of 2020, Thomas Holme, Editorial, *Journal of Chemical Education*, **2020**, *97*, 1509-1510.

44. Chemistry Education in Times of Disruption and the Times That Lie Beyond, Editorial, *Journal of Chemical Education*, **2020**, *97*, 1219-1220.

45. The Emerging Role of Prepublication in Chemistry Education, Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2020**, *97*, 595-596.

46. The Winding Path toward Research-Informed Teaching Practices, Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2020**, *97*, 311-312.

47. Reproducibility, Replication, and Generalization in Research about Teaching Innovation. Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2019**, *96*, 2359-2360.

48. What Do We Miss about Students' Individual Decision Making by Focusing Only on Overall Trends? Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2019**, *96*, 1537-1538.

49. Can Today's Chemistry Curriculum Actually Produce Tomorrow's Adaptable Chemist? Thomas A. Holme, Editorial, *Journal of Chemical Education*, **2019**, *96*, 611-612.

50. A Central Learning Outcome for the Central Science. Thomas A. Holme and James E. Hutchison, Editorial, *Journal of Chemical Education*, **2018**, *95*, 499-501. doi: 10.1021/acs.jchemed.8b00174

Standardized Examinations for the Division of Chemical Education of the American Chemical Society (Note: Officially, exams are released for purchase and use but are not "published" under the legal definitions related to secure exams.) :

- 2002 First Term General Chemistry
- 2002 Second Term General Chemistry
- 2002 Inorganic Chemistry
- 2003 Biochemistry
- 2003 High School Chemistry
- 2003 General Chemistry
- 2004 Organic Chemistry
- 2004 Advanced High School Chemistry
- 2004 First Term General Chemistry (ACS Text)
- 2005 General Chemistry
- 2005 High School Chemistry
- 2005 First Term General Chemistry
- 2005 1st Term General Chemistry Paired Questions
- 2006 Physical Chemistry – Thermodynamics
- 2006 Physical Chemistry – Quantum Mechanics
- 2006 Physical Chemistry – Dynamics
- 2006 Physical Chemistry – Comprehensive
- 2006 Physical Chemistry – Combined Semester
- 2006 General Chemistry – Brief Exam
- 2006 Second Term General Chemistry
- 2006 High School Advanced Exam
- 2006 California Diagnostic Exam
- 2007 General Chemistry Exam
- 2007 High School Chemistry Exam
- 2007 2nd Term General Chemistry Paired Questions Exam
- 2007 Analytical Chemistry Exam
- 2007 Biochemistry Exam
- 2008 General Chemistry (Spanish Version)
- 2008 Organic Chemistry
- 2008 Organic Chemistry (Spanish Version)
- 2008 General Chemistry (Conceptual)
- 2008 Diagnostic of Undergraduate Chemistry Knowledge Exam
- 2009 Inorganic Chemistry
- 2009 High School Chemistry
- 2009 Chemistry in Context
- 2009 Toledo Placement Exam
- 2009 General Chemistry
- 2009 First-term General Chemistry Exam
- 2009 Instrumental Analysis Exam
- 2010 Second-term General Chemistry Exam
- 2010 High School Advanced Exam
- 2010 First-term Organic Chemistry Exam
- 2011 General Chemistry Exam
- 2011 High School Chemistry Exam
- 2012 Organic Chemistry Exam
- 2012 Biochemistry Exam
- 2013 Analytical Chemistry Exam
- 2013 General Chemistry Exam
- 2013 Diagnostic of Undergraduate Chemistry Knowledge Exam
- 2013 High School Chemistry Exam
- 2013 Physical Chemistry – Thermodynamics Exam
- 2013 Physical Chemistry – Quantum Mechanics Exam

- 2014 First Term Organic Chemistry Exam
- 2014 Second Term General Chemistry Exam
- 2014 Inorganic Chemistry Exam
- 2015 General Chemistry Exam
- 2014 General Chemistry Brief Exam
- 2014 Physical Chemistry – Comprehensive Exam
- 2014 Physical Chemistry – Modular Exam
- 2015 General Chemistry First Term Exam

National and International Workshops Directed:

1. "Constructing opportunities for systems thinking within traditional general chemistry content." Thomas Holme and Peter Mahaffy, *25th IUPAC International Conference on Chemistry Education*, Sydney, Australia, July, 2018

2. "Incorporating Green Chemistry Concepts into the Anchoring Concepts Content Map", Thomas Holme and Kristen Murphy, *National Meeting of the American Chemical Society*, Washington, DC, August 2017

3. "Building a map of the undergraduate chemistry content: Physical Chemistry", Thomas Holme, *Great Lakes Regional Meeting of the American Chemical Society*, Fargo, ND, June 2017

4. "Machine Assisted Test Item Alignment", Thomas Holme, April Zenisky, Dave Hart, *National Meeting of the American Chemical Society*, Denver, CO, March 2015

5. "Mapping the content of Inorganic Chemistry to anchoring concepts for ACS Exams and Criterion Referencing", Thomas Holme and Kristen Murphy, *National Meeting of the American Chemical Society*, Denver, CO, March 2015

6. "Comparing Personally Written Test Items with ACS Exams Items", Thomas Holme and David Hart, *Biennial Conference on Chemical Education*, Allendale, MI, August 2014

7. "Mapping the content of Analytical Chemistry to anchoring concepts for ACS Exams and Criterion Referencing", Thomas Holme and Kristen Murphy, *National Meeting of the American Chemical Society*, Philadelphia, PA, August 2012

8. "Mapping the content of Physical Chemistry to anchoring concepts for ACS Exams and Criterion Referencing", Thomas Holme and Kristen Murphy, *National Meeting of the American Chemical Society*, Anaheim, CA, March 2011

9. "Mapping the content of Biochemistry to anchoring concepts for ACS Exams and Criterion Referencing", Thomas Holme and Kristen Murphy, *National Meeting of the American Chemical Society*, Anaheim, CA, March 2011

10. "Mapping the content of Analytical Chemistry to anchoring concepts for ACS Exams and Criterion Referencing", Thomas Holme and Mary Emenike, *Pittsburgh Conference*, Atlanta, GA, March 2011

11. “Complexity Analysis of Organic Chemistry Test Items”, Kristen Murphy and Thomas Holme, *National Meeting of the American Chemical Society*, Anaheim, CA, March 2011

12. “Complexity Analysis of Organic Chemistry Test Items”, Kristen Murphy and Thomas Holme, *Joint Southeast/Southwest Meeting of the American Chemical Society*, New Orleans, LA December, 2010

13. “Building a map of the undergraduate chemistry content: Physical Chemsitry”, Kristen Murphy, April Zelinski and Thomas Holme, *National Meeting of the American Chemical Society*, San Francisco, CA, March 2010

14. “Alignment of ACS organic chemistry items to a content criterion map” Kristen Murphy, April Zelinski and Thomas Holme, *National Meeting of the American Chemical Society*, San Francisco, CA, March 2010

15. “Alignment of ACS first-term general chemistry items to a content criterion map” Kristen Murphy, April Zelinski and Thomas Holme, *National Meeting of the American Chemical Society*, San Francisco, CA, March 2010

16. “Alignment of ACS second-term general chemistry items to a content criterion map” Kristen Murphy, April Zelinski and Thomas Holme, *National Meeting of the American Chemical Society*, San Francisco, CA, March 2010

17. “Alignment of ACS general chemistry items to a content criterion map: Kristen Murphy, April Zelinski and Thomas Holme, *National Meeting of the American Chemical Society*, Washington, DC, August 2009

18. “Building a map of the undergraduate chemistry content: Organic Chemistry”, Kristen Murphy, April Zelinski and Thomas Holme, *National Meeting of the American Chemical Society*, Washington, DC, August 2009

19. “Rating task complexity for multiple-choice chemistry exam items”, Kristen Murphy, April Zelinski and Thomas Holme, *National Meeting of the American Chemical Society*, Washington, DC, August 2009

20. “Testing as Measurement and Sources of Error”, Thomas Holme, *Chemistry Education Research Graduate Student Conference*, Miami University, Oxford, OH, June 2009

21. “Rating task complexity for multiple-choice chemistry exam items”, Thomas Holme and Kristen Murphy, *National Meeting of the American Chemical Society*, Salt Lake City, UT, March 2009

22. “Mapping the fine grain level of the content domain for General Chemistry”, Kristen Murphy and Thomas Holme, *National Meeting of the American Chemical Society*, Salt Lake City, UT March, 2009

23. “Electronic Delivery of ACS Exams”, Thomas Holme and David Hart, *Biennial Conference on Chemical Education*, Bloomington, IN, July 2008.

24. “Investigating the Content of Multiple Choice Exam Items on ACS Exams via Criterion Referencing”, Thomas Holme, *Biennial Conference on Chemical Education*, Bloomington, IN, July 2008.

25. “Mapping the content of General Chemsitry to anchoring concepts for ACS Exams and Criterion Referencing”, Kristen Murphy and Thomas Holme, *Biennial Conference on Chemical Education*, Bloomington, IN, July 2008.

26. “Developing Assessment Tools in a Discipline”, Stacey Lowery Bretz and Thomas Holme, *CCLI Conference: Inventions and Impact 2: Building Excellence in Undergraduate STEM Education*, Washington, DC, August 2008

27. “Mapping the content of Organic Chemistry to anchoring concepts for ACS Exams and Criterion Referencing”, Thomas Holme and Kristen Murphy, *National Meeting of the American Chemical Society*, Philadelphia, PA, August 2008

Invited Presentations: (past 10 years)

1. “Helping students visualize the chemistry of how to address complex Earth and societal challenges through systems thinking”, Thomas Holme, Micke Reynders, *One Year Anniversary of the Stockholm Declaration 24-Hour Webinar*, May 2026

2. “Understanding the chemical basis of sustainability as a core motivation for learning chemistry”, Thomas Holme, **Kritzler Lecture**, *Ohio Northern University*, Ada, OH, April 2026.

3. “Measuring how students make connections between chemistry and Earth and societal systems”, Thomas Holme, Chemistry Departmental Seminar, *Ohio Northern University*, Ada, OH, April 2026

4. “Impact of special issues of The Journal of Chemical Education”, Thomas Holme, *National meeting of the American Chemical Society*, Atlanta, GA, March 2026.

5. “Green Chemistry in Higher Education; How did we get here?”, Amy Cannon, Jane Wissinger, Loyd Bastin, Thomas Holme, Irv Levy, Panel Discussion, *National meeting of the American Chemical Society*, Atlanta, GA, March 2026.

6. “Implementation and Analysis of a Free-form Intelligent Tutoring System for General Chemistry Calculations”, Thomas Holme, *Pacifichem 2025*, Honolulu, HI, December 2025.

7. "A Decade of Thematic Chemistry Applications Examples to Introduce Components of Systems Thinking in General Chemistry, Thomas Holme, *Pacifichem 2025*, Honolulu, HI, December 2025.

8. "Investigating Student's Conceptual Understanding with a Gamified Online Homework System and Eye Tracking", Morgan Clark and Thomas Holme, *Pacifichem 2025*, Honolulu, HI, December 2025.

9. "Using Aspects of Systems Thinking and Sustainability to Map Out Chemistry's Connection to Wildfires in First-year Chemistry", Micke Reynders, Thomas Holme, *Pacifichem 2025*, Honolulu, HI, December 2025.

10. "Trajectory towards sustainability as a key theme in General Chemistry", Thomas Holme for the Committee on the Environment and Sustainability, *ACS National Meeting*, Washington, DC, August 2025.

11. "Combustion friend or foe: Sustainability connections in general chemistry", Thomas Holme, *29th Annual Green Chemistry and Engineering Conference*, Pittsburgh, PA, June 2025.

12. "Incorporating systems thinking and sustainability at scale in large lecture settings", Thomas Holme and Micke Reynders, *ACS National Meeting*, San Diego, CA, March 2025.

13. "Adding Systems Thinking to First-Year Chemistry and it's Impact on Learning", Thomas Holme, Chemistry Departmental Seminar, University of California – Davis, Davis, CA, February 2025

14. "Contemplating the Role of Systems Thinking in Chemistry and Chemistry Education", Thomas Holme, Chemistry Departmental Seminar, San Jose State University, San Jose, CA, February 2025

15. "From Concept Maps to SOCMEs: Connecting Chemistry to Sustainability", Thomas Holme, Micke Reynders, *International Conference on Chemical Education*, Pataya, Thailand, July 2024, Keynote Speaker

16. "Tools to Assist Student Writing and Learning about Chemistry within Earth and Societal Systems", Thomas Holme and Annabelle Lolinco, *Graduate Student Selection Seminar*, Nanyang Technological University, Singapore, July 2024

17. "Tips for Publishing Educational Innovation in Discipline-based Education Journals", Thomas Holme, National University of Singapore, Singapore, July 2024.

18. "Learning from the use of curated chatbots to engage with students in chemical education", Annabelle Lolinco and Thomas Holme, *Canadian Chemistry Conference and Exhibition*, Winnipeg, MN, Canada, June 2024

19. "Learning from the use of curated chatbots to engage with students in chemical education", Annabelle Lolinco and Thomas Holme, *AAAS – IUSE Summit*, Washington, DC, June 2024

20. "Emerging Trends in the Use of Generative AI in Chemistry Education", Thomas Holme, Emily King, Annabelle Lolinco, Micke Reynders, *ESCIP Conference*, Iowa State University, Ames, IA, May 2024

21. "Understanding Assessment of Learning and the Connections to the Complexity of Content being Assessed", Thomas Holme, *Chemistry Departmental Seminar*, George Washington University, Washington, DC, April 2024

22. "Personalizing the introductory student connection to chemistry by incorporating sustainability", Thomas Holme, Micke Reynders, Morgan Clark, *ACS National Meeting*, New Orleans, LA, March 2024

23. "Tips for Publishing Educational Innovation in Discipline-Based Education Journals", Thomas Holme, *Center for Teaching Excellence Roundtable Presentation*, Rice University, Houston, TX, March 2023

24. "Old and New Ways to Support Student Writing about Chemistry Connections to Systems Thinking", Thomas Holme, Annabelle Lolinco, *Texas Community College Teachers Association General Convention*, Houston, TX, March 2023.

25. "From Context to Systems Thinking in Chemistry Education", Thomas Holme, Keynote Speaker, *44th National Convention of the South African Chemistry Institute*, Stellenbosch, South Africa, January 2023

26. "Analyzing the evolution of chemistry teaching responses to the SARS-CoV-2 pandemic", Thomas Holme, *Atlantic Basin Conference on Chemistry*, Marrakech, Morocco, December 2022

27. "Exploring the role of journal special issues in translating theory into practice", Thomas Holme, *ACS Midwest Regional Meeting*, Iowa City, IA October 2022

28. "Debunking Publishing Myths: 10 Tips for Publishing in ACS Journals", *ACSWebinars*, Thomas Holme & Kelly Chibale, Internet Webinar Presentation, October 13, 2022 – viewed by 520 people.

29. "Using systems thinking concepts to build a connecting thread of real world applications for general chemistry topics." Thomas Holme, *Biennial Conference on Chemical Education*, West Lafayette, IN, August 2022.

30. “Moving along the pandemic response continuum from survival towards intentionality.” Melanie Cooper, Thomas Holme, *Biennial Conference on Chemical Education*, West Lafayette, IN, August 2022

31. “Where we’ve been. Where we are. Where we’re going.” Thomas Holme, *Biennial Conference on Chemical Education*, West Lafayette, IN, August 2022.

32. “Systems thinking in foundational chemistry: connecting chemistry content to earth and societal systems”, Thomas Holme, Plenary Talk, *International Conference on Chemical Education,* Cape Town, South Africa, July 2022 – delivered remotely due to Covid-19

33. “Analysis of efforts in computational chemistry education published in the Journal of Chemical Education”, Thomas Holme, 12th Triennial Congress of the World Association of Theoretical and Computational Chemists, Vancouver, BC, Canada, July 2022

34. “Likert Scales and Some Alternatives for Measuring Affect Related to Teaching Changes”, Thomas Holme, Jiwoo An, Chris Bauer, Mary Emenike, *Canadian Chemistry Conference and Exhibition*, Calgary, AB, Canada, June 2022

35. “Student Writing as a Key Component of Assessing Sustainability and Systems Thinking in General Chemistry”, Thomas Holme, *Green Chemistry and Engineering Conference*, Reston, VA, June 2022

36. “Using Artificial Intelligence to Support Open-Ended Problem Solving in Chemistry”, Thomas Holme, David Yaron, Emily King, Sandra Raysor, Maxwell Benson, Jonathon Sewall, Kenneth Koedinger, *IUSE-Summit*, Washington, DC., June 2022

37. “Contemplating the Role of Systems Thinking in Chemistry and Chemistry Education”, Thomas Holme, Keynote Speaker, *Lester Andrews Graduate Research Symposium*, Mississippi State University, Starkville, MS, May, 2022

38. “Measuring student learning of connections of general chemistry content to broader societal contexts”, Thomas Holme and Annabelle Lollinco, *ACS National Meeting*, San Diego, CA, March, 2022

39. “Exploring student conceptions of scientific instruments and measurements”, Thomas Holme and Jiwoo An, *ACS National Meeting*, San Diego, CA, March, 2022

40. “Editors Panel on Publishing and Academic Bullying”, Arianna Colosio, Thomas Holme, Charlotte Payne, Jonathan Sweedler, *Academic Parity Movement 2nd Annual Conference*, East Lansing, MI (Virtual), March 2022.

41. “Using Systems Thinking Concepts in General Chemistry to Combat Compartmentalized Knowledge Acquisition”, Thomas Holme, *Departmental Seminar*, University of Northern Colorado, Greeley, CO (virtual), February, 2022.

42. “Combating Compartmentalized Chemistry Knowledge with Systems Thinking”. *Chinese Chemical Society - American Chemical Society Chemical Education Forum*, Beijing China (Virtual), November, 2021

43. “Using Systems Thinking Concepts in General Chemistry to Combat Compartmentalized Knowledge Acquisition”, Thomas Holme, *Departmental Seminar*, University of North Texas, Denton, TX, November, 2021.

44. “Using Systems Thinking Concepts in General Chemistry to Combat Compartmentalized Knowledge Acquisition”, Thomas Holme, *1st International Seminar on Chemistry and Chemical Education*, Keynote Speaker, Pattimura University, Ambon-Maluku, Indonesia (Virtual) September 2021.

45. “New Affordances in Measuring Student Conceptual Knowledge in Chemistry via Technology”, Thomas Holme, *Latsis Symposium 2021: STEM*, Zurich, Switzerland, September, 2021

46. “Communicating scholarly efforts in chemistry education over the past century in the Journal of Chemical Education”, Thomas Holme, *ACS National Meeting*, Atlanta, GA (Virtual), August, 2021

47. “Ammonia: Smelling Salts for Systems Thinking in Chemistry Education”. Marc Whalen, Peter Mahaffy, Jaclyn J. Stewart, Thomas Holme, Stephen A. Matlin, *Canadian Chemistry Conference and Exhibition,* Montreal, QC, (Virtual), August, 2021

48. “Incorporating Systems Thinking Within the Constraints of the General Chemistry Curriculum Using Human Health as a Context”. Thomas Holme *Canadian Chemistry Conference and Exhibition,* Montreal, QC, (Virtual), August, 2021

49. “From Busy Hands to Busy Minds: General Chemistry Labs - What Does the Future Hold?” Rebecca Eikey, Pamela Auburn, Thomas A. Holme, *2-Year College Chemistry Consortium Community Forum*, (Virtual), March 2021

50. “Sustainability conversations to connect general chemistry to Earth and societal systems”. *Texas Community College Teachers Association Conference* (online) Houston, TX, February 2021

51. “Complexity and Chemistry Content when Teaching in Interesting Times” *Education Seminar*, Department of Chemistry, University of York, York, England, October 2020.

52. “Complexity and Chemistry Content when Teaching in Interesting Times” *Seminar, Wisconsin Initiative for Science Literacy*, University of Wisconsin - Madison, Madison, WI, September 2020.

53. “Expanding boundaries in general chemistry to build a systems thinking approach to life cycle analysis for a pharmaceutical molecule”, *Green Chemistry and Engineering Conference*, Thomas A. Holme, on-line, June 2020.

54. “Using Systems Thinking Concepts in General Chemistry to Combat Compartmentalized Knowledge Acquisition”, Thomas Holme, *Gomberg Seminar*, *Department of Chemistry*, University of Michigan, Ann Arbor, MI, February 2020.

55. “Helping Foundations Flourish: Systems Thinking as a Means to Connect Introductory Chemistry to Broader Science Studies”, Thomas Holme, *Colloquium, Department of Chemical and Physical Sciences,* University of Toronto - Mississauga, Toronto, ON, January 2020

56. "Gauging Chemistry Learning by Measuring More Than the Final Answer", Thomas Holme, *Departmental Seminar, Department of Chemistry*, North Dakota State University, Fargo, ND November 2019.

57. "Gauging Chemistry Learning by Measuring More Than the Final Answer", Thomas Holme, *Departmental Seminar, Department of Chemistry*, Indiana University - Purdue University Indianapolis, Indianapolis, IN September 2019.

58. “Using Systems Thinking Concepts in General Chemistry to Combat Compartmentalized Knowledge Acquisition”, Thomas Holme, *Departmental Seminar, Department of Chemistry and Biochemistry*, University of Nebraska – Lincoln, Lincoln, NE, September 2019.

59. “Assessment Considerations for Implementing New Educational Technology in Chemistry”, Thomas Holme, *Gordon Research Conference on Chemistry Education Research and Practice*, Lewiston, ME, June 2019.

60. “Bigger boundaries: Systems thinking and incorporating green concepts in gateway chemistry classes”, Thomas Holme, *9th Green Chemistry and Engineering Conference*, Reston, VA, June 2019

61. “Expanding the boundaries of students' chemistry knowledge through systems thinking” , Thomas Holme, *102nd Canadian Chemistry Conference and Exhibition*, Quebec City, QC, June 2019

62. “Including systems thinking in general chemistry” , Thomas Holme, *STEM Education Seminar*, Rutgers University, New Brunswick, NJ, November 2018

63. “Systems thinking, planetary boundaries and the possibilities of a more connected chemistry curriculum”, Thomas Holme, *Chemistry Seminar, University of Iowa*, Iowa City, IA, September 2018

64. “ARiEL: Augmented Reality in Educational Laboratories”, Thomas Holme, Poly Laila-Parvin, Jiwoo An *25th Biennial Conference on Chemistry Education,* Notre Dame, IN, August 2018

65. "Adding Systems Thinking to the Anchoring Concepts Content Map", Thomas Holme, Kristen Murphy, Jeff Raker *25th IUPAC International Conference on Chemistry Education,* Sydney, Australia, July 2018

66. "Connecting green chemistry topics to the Anchoring Concepts Content Map", Thomas Holme and Kristen Murphy *22nd Annual Green Chemistry & Engineering Conference,* Portland, OR June 2018

67. "The importance of teaching systems thinking and the role that green chemistry can play", Thomas Holme *22nd Annual Green Chemistry & Engineering Conference,* Portland, OR June 2018

68. "A template for constructing green chemistry related content that promotes systems thinking opportunities for students." Thomas Holme, James Hutchison, Julie Haack, David Constable, Mary Kirchhoff, Jenifer MacKellar *22nd Annual Green Chemistry & Engineering Conference,* Portland, OR June 2018

69. "The Primary Outcome: What should the highest level learning outcome be for General Chemistry?" Thomas Holme, James Hutchison, Julie Haack, Mary Kirchhoff, David Constable, Jenny MacKellar, *101st Meeting of the Canadian Society of Chemistry*, Edmonton, AB, May 2018.

70. "Addressing issues in Chemistry Education Research projects", Thomas Holme, *Conference for Connecting the Canadian Chemistry Education Research Community*, Edmonton, AB, May 2018.

71. "ARiEL: Augmented Reality in Educational Laboratories", Thomas Holme, Poly Laila-Parvin, *ACS National Meeting,* New Orleans, LA, March, 2018

72. "Rigor in general chemistry doesn't equal math: The role of systems thinking" Thomas Holme *ACS National Meeting,* New Orleans, LA, March, 2018

73. "What is the Venn diagram of the chemistry curriculum and the chemistry most often in the news?" Thomas Holme, Annabelle Lolinco, Christina Kindle, *ACS National Meeting,* New Orleans, LA, March, 2018

74. "Three key factors for successful reform efforts in chemistry education", Thomas Holme, *101st Meeting of the Canadian Society of Chemistry*, Edmonton, AB, May 2018.

75. "Assessing Student Learning of Climate Change after Adding Sustainability Concepts to General Chemistry", Thomas Holme and Marcy Towns, *Great Lakes Regional Meeting of the American Chemical Society*, Fargo, ND, June 2017.

76. "Does the Undergraduate Chemistry Curriculum Help or Hinder the Inclusion of Cross-cutting Scientific Principles as Learning Objectives?", Keynote Speaker, *100th National Meeting of the Canadian Society of Chemistry*, Toronto, ON, May, 2017.

77. "The Roles of Assessment in Chemistry Education", Keynote Speaker, *Georgia General Chemistry Network Annual Meeting*, Athens, GA, May 2017.

78. "Evidence and Change, or Lack Thereof" Pimentel Award Address, *National Meeting of the American Chemical Society*, San Francisco, CA, April 2017.

79. "Flavors of Assessment in Chemistry Education and Chemistry Education Research", *National Meeting of the American Chemical Society*, San Francisco, CA, April 2017.

80. "What do our measures of student learning miss?" *James Flack Norris Award Lecture*, meeting of the Northeastern Section of the American Chemical Society, Boston, MA, November 2016.

81. "Research on measurements in the classroom and what it tells us about teaching and learning chemistry." *Departmental Colloquium*, Brandeis University, Newton, MA, November, 2016.

82. "The sometimes surprising evolution of undergraduate student understanding of chemical bonding", *Physical/Analytical Chemistry Seminar*, The Ohio State University, Columbus, OH, September 2016.

83. "Engaging Students by Including Chapter 18 in First Semester General Chemistry", Thomas Holme and Marcy Towns, *Northwest Regional ACS Meeting*, Anchorage, AK, June 2016.

84. "Enhancing Comparative Assessment in Chemistry with the QMAP System", Thomas Holme, David Hart, Steve Battisti, April Zenisky, Kristen Murphy. *Envisioning the Future of Undergraduate STEM Education: Research and Practice.* Washington, DC April 2016.

85. "Understanding student problem solving by measuring more than the final answer." *L. Carroll King Lecture*, Department of Chemistry, Northwestern University, Evanston, IL, April 2016.

86. "Role of homework in the 'grade game'", Thomas Holme, *National Meeting of the American Chemical Society*, San Diego, CA, March 2016.

87. "Using needs analysis in the development of tools to help instructors enhance their content assessment", Thomas Holme and David Hart, *National Meeting of the American Chemical Society*, San Diego, CA, March 2016.

88. "How do Educational Measurements Affect the Teaching and Learning of Chemistry?" *L. Carroll King Lecture*, Department of Chemistry, Northwestern University, Evanston, IL, January 2016.

Contributed Papers (at conferences – past 10 years):

1. "Promoting Student Help-Seeking with Curated Chatbots", Morgan Clark, Micke, Reynders, Thomas Holme, *Pacifichem 2025*, Honolulu, HI, December 2025
2. "ChatGPT vs. Students: Who Wrote it Better?", Morgan Clark, Micke, Reynders, Thomas Holme, *National Meeting of the American Chemical Society,* Denver, CO, August 2024 – poster invited to SciMix and as an Interactive Poster in the Symposium on Generative AI in Chemistry Education.
3. "ChatGPT vs. Students: Who Wrote it Better?", Morgan Clark, Micke, Reynders, Thomas Holme, *Biennial Conference on Chemical Education,* Lexington, KY, July 2024
4. "Systems thinking in chemistry and visualizing complexity for sustainability", Micke Reynders, Thomas Holme, *Biennial Conference on Chemical Education,* Lexington, KY, July 2024
5. "Utilizing eye-tracking in a chemistry online homework gamification study", Morgan Clark, Thomas Holme, *Biennial Conference on Chemical Education,* Lexington, KY, July 2024
6. "Scaling chemistry writing soundboard sessions for large lecture classrooms using curated chatbots", Annabelle Lolinco, Thomas Holme, *Joint Midwest & Great Lakes Regional ACS Meeting, St. Louis*, MO, October 2023.
7. "Extending chatbot use cases across chemistry education spaces", Annabelle Lolinco, Emily King, Thomas Holme, *Joint Midwest & Great Lakes Regional ACS Meeting, St. Louis*, MO, October 2023.
8. "Implementation and analysis of a free-form intelligent tutoring system for general chemistry calculations." Emily King, Thomas Holme, David Yaron, Sandra Raysor, Maxwell Benson, Jonathon Sewall, Kenneth Koedinger, *Biennial Conference on Chemical Education*, West Lafayette, IN, August 2022
9. "Student interactions with open-response chemistry tutors." Emily King, Thomas Holme, David Yaron, Sandra Raysor, Maxwell Benson, Jonathon Sewall, Kenneth Koedinger, *Biennial Conference on Chemical Education*, West Lafayette, IN, August 2022
10. "Helping students synthesize chemistry with context through soundboarding." Annabelle Lolinco, Thomas Holme, *Biennial Conference on Chemical Education*, West Lafayette, IN, August 2022
11. "Integrating chatbots into the chemistry classroom." Annabelle Lolinco, Thomas Holme, *Biennial Conference on Chemical Education*, West Lafayette, IN, August 2022

12. “Analyzing student engagement and learning with an intelligent tutoring system”, Emily King, Thomas Holme, David Yaron, Sandra Raysor, MaxBenson, Jonathon Sewall, Kenneth Koedinger, *ACS National Meeting*, Atlanta, GA, (Virtual), August, 2021

13. “Talk it out: Using soundboards as an educational tool for writing in chemistry classrooms”, Annabelle Lolinco, Thomas Holme, *ACS National Meeting*, Atlanta, GA, (Virtual), August, 2021

14. “Strengthening the Role and Relevance of the Chemical Sciences for the Future of our Planet: Systems Thinking in Chemistry Education”, Peter Mahaffy, Thomas Holme, Stephen A. Matlin, Jaclyn J. Stewart, Marc Whalen, *IUPAC World Congress,* Montreal, QC, August, 2021

15. “Using systems thinking and earth and societal systems to enhance student learning in General Chemistry”, Thomas Holme, *IUPAC World Congress*, Paris, FR July 2019.

16. “A Cognitive Tutor for Open-Ended Problem-Solving in Chemistry”, David Yaron, Sandra Raysor, Max Benson, Jonathan Sewall, Kenneth Koedinger, Thomas Holme, *Gordon Research Conference on Chemistry Education Research and Practice,* Lewiston, ME, June 2019.

17. “Augmented Reality in Educational Laboratories”, Jiwoo An and Thomas Holme, *Gordon Research Conference on Chemistry Education Research and Practice,* Lewiston, ME, June 2019.

18. “Augmented Reality in Educational Laboratories”, Jiwoo An and Thomas Holme, *Midwest Regional Meeting of the American Chemical Society,* Ames, IA, October 2018.

19. “Green chemistry and the systems thinking connection”, Thomas Holme, James Hutchison, Julie Haack, Jenny MacKellar *25th Biennial Conference on Chemistry Education,* Notre Dame, IN, August 2018

20. “Ensuring test takers can use new chemistry assessments made possible by technology” Jack Polifka, Thomas Holme *25th Biennial Conference on Chemistry Education,* Notre Dame, IN, August 2018

21. “Measuring student planning as a way of understanding their strategies with multiple representations” Jack Polifka, Thomas Holme *25th Biennial Conference on Chemistry Education*, Notre Dame, IN, August 2018

22. “The importance of design features in education technology” Jiwoo An, Thomas Holme *25th Biennial Conference on Chemistry Education,* Notre Dame, IN, August 2018

23. “Considering earth and societal systems as ways to infuse systems thinking in chemistry education”, Thomas Holme, Peter Mahaffy, Stephen Matlin, Jenny MacKellar *25th IUPAC International Conference on Chemistry Education,* Sydney, Australia, July 2018

24. “Promoting Systems Thinking in Chemistry Education – Relevant Aspects of Chemistry Teaching and Learning” Felix Ho, Mei-Hung Chiu, Thomas Holme, Jenny MacKellar,

Marcy Towns *25th IUPAC International Conference on Chemistry Education,* Sydney, Australia, July 2018

25. " Progress Report on a Roadmap for Green Chemistry Education ", Jenny MacKellar, Thomas Holme, James Hutchison *25th IUPAC International Conference on Chemistry Education,* Sydney, Australia, July 2018

26. " Systemigrams as Tools for Modelling Approaches to Systems Thinking in Chemistry Education", Thomas Holme, Jan Apotheker, Felix Ho, Rea Lavi *25th IUPAC International Conference on Chemistry Education,* Sydney, Australia, July 2018

27. "Measuring student argumentation skills at scale: What would we want to know and how could it be measured?", Thomas Holme, David Yaron, Ken Koedinger, Sandra Raysor, , *101st Meeting of the Canadian Society of Chemistry*, Edmonton, AB, May 2018.

28. "Allowing students to choose which molecular representations to use during an assessment", Thomas Holme, Jack Polifka, John Baluyut, *Gordon Research Conference on Chemistry Education Research and Practice,* Lewiston, ME, June 2017

29. "Using Machine-Learning Technology Tools to Map Test Items to a "Big Ideas" Framework", Thomas Holme and Kristen Murphy, *2-Year College Chemistry Consortium National Conference*, San Diego, CA March 2016