Assessment and Measurement in Research and Practice


5:10 Closing Remarks.
Blended instruction design and assessment: Leveraging technology to promote adaptive learning for college chemistry

J. Chamberlain, J. J. Stewart, D. Yaron, Organizers, Presiding


3:50 5. The AHA! chemistry project: Improving learning outcomes for all general chemistry students through Active, Hybrid, Adaptive courses. M. Blaser, D. Doshi

4:10 6. OLI General Chemistry Courseware: High-Quality, Low-Cost Textbook and Homework System Replacement. S. Raysor

4:30 7. Improved learning outcomes from using the Open Learning Initiative (OLI) courseware in general chemistry. D. Doshi


5:10 Closing Remarks.

C.O.V.I.D.: Carrying Over Valuable Innovative Developments

E. G. Malina, Organizer, Presiding


4:10 10. At Home Labs: Improving Students Lab Techniques Using Technique Video Quizzes. F.E. Jacobsen

4:30 11. Enhancing In-Person Learning of the General Chemistry Laboratory Course at Brown University via the Innovation Created for Remote Learning During the Pandemic. L. Wang


5:10 Closing Remarks.

WALC
B093

Disrupting Grading

R. D. Link, Organizer, Presiding


3:50 13. Using specifications-based grading in the lower-level chemistry and biochemistry curriculum at a PUI: Course design considerations and qualitative impact on students, courses and instructors. E.E. Wilson, M.V. Wilson, P.M. Smith

4:10 14. Prioritizing persistence: mastery-based grading and authentic assessments in a large, intro-level biochemistry class. R. Branco


4:50 16. Mastering Organic Chemistry and Biochemistry at one’s own pace: Use of specification grading in these classrooms. K.M. Slunt
5:10 Closing Remarks.

BRWN
1154

Engaging Students in Physical Chemistry

D. E. Gardner, C. M. Teague, Organizers, Presiding


4:10 18. Building engagement in the physical chemistry classroom with empathy, clear organization, and a focus on problem solving. W.C. Duim

4:30 19. Changes in Physical Chemistry Syllabi Focus Attributed to the Transition to Remote Instruction. J. Donnelly, K. Winkelmann


5:10 Closing Remarks.

WALC
1018

Improving implementation of innovative laboratory models

S. J. Gravelle, Organizer
D. I. Del Carlo, Presiding


4:10 22. Combining forces: SWH and POGIL-PCL in the Physical Chemistry laboratory. **S.J. Gravelle**

4:30 23. Revising a Standard Experiment to Incorporate Inquiry: NMR of the Keto-Enol System. **A. Grushow**


5:10 Closing Remarks.

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WALC 1132

**Innovations, challenges, and practices in large-enrollment laboratory courses**

K. A. Gesmundo, *Organizer, Presiding*


3:50 25. The organic planner: Challenges and opportunities. **M. Patwardhan, M. Ogbaje**

4:10 26. Lessons learned from large-scale implementation of Undergraduate Laboratory Assistants Program during a pandemic. **L. Gustin, S. Block, C. Wilkinson, L. Stoll**

4:30 27. Critiquing Lab Technique Videos Prior to In Class Use. Can it Improve Technique?. **S. Tenney, J. Casey, A.A. Russell**
4:50 **28.** Lessons Learned from a Year of Specifications Grading in a Large-Enrollment General Chemistry Lab. **L. Morkowchuk**

5:10 Closing Remarks.

WALC
2087

**Learning for All: Making Chemistry Instruction Accessible to Blind/ Low-Vision Students**

A. T. DAgostino, *Organizer, Presiding*


3:50 **29.** Practical Guide to Accessible Chemistry Instruction for Blind and Low-Vision Students. **A.T. DAgostino**

4:10 **30.** Multiline Tactile Display: Braille for Future Chemists. **A.E. Neybert**

4:30 **31.** 3D tactile images to teach STEM courses to visually impaired and sighted students. **E. Hasper,** R. Windhorst, T. Hedgpeth, L. Van Tuyl, A. Gonzales, B. Martinez, H. Yu, Z. Farkas, D. Baluch

4:50 **32.** Customized 3D Printed Molecular Modeling Kits for use in Lecture Halls and with Visually Impaired Students. **A.C. Davis,** R. Virtue, J.M. Smith

5:10 Closing Remarks.

WALC
3087

**STEM Persistence Amid a Pandemic**
B. L. Gonzalez, S. Villafane-Garcia, Organizers
J. Chan, Organizer, Presiding
L. Ye, Presiding


3:50 **33. Seeding Your Future Conference, taking a STEAM conference from in-person to virtual back to in-person again.** J.R. Cole, H. Albright, K. Dartt, C. Melton, S. Murphy

4:10 **34. Impact of the Phone A STEM Professional assignment on organic chemistry students’ sense of belonging, career awareness, and career confidence.** K. Babics, M. Schen, S.E. Martín

4:30 **35. Development and Implementation of Mindset and Metacognitive Learning Strategies Workshops in a First-year Chemistry Course.** T. Nguyen, J. Chan, S. Villafane-Garcia


5:10 Closing Remarks.

**MONDAY**

WALC
2087

**Demystifying Spectroscopy: Methods, Innovations, and Best Practices for Teaching Spectroscopic Interpretation and Structure Elucidation in the Undergraduate Classroom.**
C. Theodore, Organizer, Presiding

8:00 Introductory Remarks.


8:25 117. Infrared Spectroscopy in the General Chemistry Laboratory. **K. Stewart**

8:45 118. Teaching Spectroscopy in Organic Chemistry with Spectra. **B.A. Hathaway**

9:05 Panel Discussion.

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 119. Teaching Organic Instrumentation Using an Online "Choose Your Own Adventure" Website Created Using the Open Source Tool Twine. **F.E. Jacobsen**

11:25 120. A card game for spectroscopy learning in organic chemistry. **J. Ferguson**


12:05 Panel Discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:25 123. Putting the puzzle pieces together: A systematic approach to solving proton NMR problems. **L. Starkey**

2:45 124. Advances in benchtop NMR spectroscopy for the teaching laboratory; higher fields and lower costs. **J. Frost**, C. Karunaweera, J. Price

3:05 Panel Discussions.

3:25 Closing Remarks.

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**Inclusive practices for unrepresented groups in STEM**

N. Lapeyrouse, T. Legron-Rodriguez, *Organizers, Presiding*

8:00 Introductory Remarks.


8:25 226. Increasing inclusivity of women in STEM: Organizing and improving Arkansas’ virtual women in STEM conference. **S.K. Hamilton**, **S.E. Hubbard**

8:45 227. Increasing access to undergraduate research experiences: The OURA Lab. **C. Ngai**

9:05 228. Creating Support Structures to Promote Success for Underrepresented STEM Students. **M.B. Jensen**

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.
11:05 229. Inclusive practices for reducing gender-based stereotype threat in undergraduate classrooms: Results from a national survey. **M. Connor**


11:45 231. Growing connections from day one: Going beyond the syllabus to develop a foundation for student success. **Z. Mensinger**, K.R. Ries

12:05 232. Student Partnerships and Staff networks as powerful and democratic forces for change: Case Study exploring how the National Association of Disabled Staff Networks (NADSN) STEMM Action Group and Student Partners progress Disability inclusion in Higher Education Institutions and Beyond. **J. Sarju**

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.


2:25 234. Curated content: Anti-racist and inclusive physical science resources on a library research guide. **M. Finnegan**

2:45 235. Investigating the trend of BIPOC representation in chemistry textbooks. **M. Brackett**, C. Lopez-Castilla, B. Chiu, N. Lapeyrouse


3:25 Closing Remarks.

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**Systems Thinking in Chemistry Education: What it is and why we should do it**

STEW
214ABCD
8:00 Introductory Remarks.

8:05 266. Introduction to systems thinking: Benefits and challenges for chemistry education. **M. Orgill, S.E. York**


8:45 268. Instructors’ definitions and understandings of systems thinking in the context of tertiary chemistry classrooms. **S.E. York, M. Orgill**

9:05 269. Development of two modules for foundational chemistry courses: introduction to systems thinking and learning kinetics with systems thinking. **J.B. Randazzo, K. Aubrecht**

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 270. Mapping sustainability into chemistry education: exploring the implications of linkages with frameworks, principles and tools. **S. Matlin**

11:25 271. Applying Instructional Design to Teach Systems Thinking. **J.J. Stewart**

11:45 272. Instructors’ decision making about climate change instruction. **M. Weinrich, P. Wilson**

12:05 273. Cultivating Connection in the Analytical Chemistry Classroom. **G. Clark**

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:25 275. Using systems thinking concepts to build a connecting thread of real world applications for general chemistry topics. T. Holme

2:45 276. Systems Thinking in Student Reasoning about Glycolysis. T. Barton

3:05 277. Autocatalytic networks in the classroom. M. Huang, B. Alappat, Y. Sawalha

3:25 Closing Remarks.

STEW
202

Training, mentoring, and managing laboratory teaching assistants

R. D. Link, D. Sokic-Lazic, Organizers
C. S. Bagwill, J. Monahan, C. J. Sobers, C. Zumalt, Presiding

8:00 Introductory Remarks.

8:05 293. Developing an inclusive pedagogy & cultural awareness training for chemistry lab TAs. C.J. Sobers, G. Santos Mendoza

8:25 294. A first attempt: Incorporating bias, diversity, and inclusion discussions into a teaching assistant training program. K.S. Anliker

8:45 295. Exploring, encouraging, and learning from the inclusive teaching practices of STEM laboratory trainee graduate teaching assistants in Higher Education. J. Sarju, L.C. Jones

9:05 296. Teaching assistants- Keeping your allies together. S.M. Mata

9:25 Closing Remarks.
9:30 Break.

11:00 Introductory Remarks.

11:05 297. What a GTA Wants: Training and Professional Development Requests by Graduate Teaching Assistants. M. Herridge

11:25 298. Mentoring Graduate Teaching Assistants Through Training Sessions and Course Offering at Brown University. L. Wang


12:05 300. Labflow & Data Insights: Using real time grading data to identify TAs in need of coaching early in the semester. D. DeSutter, E. Crowe

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 301. Expanding our TA workshop: How much time can I have? 30 hours over 8 days? Excellent!. K.S. Anliker

2:25 302. Implementing hierarchical structures and leadership skills for student workers. A. Chant

2:45 303. Managing graduate and non-graduate student TA in general chemistry lab. m. khural

3:05 304. Training and mentoring practices to foster professional growth for TA laboratory instructors. L. Funari, A.M. Bischof, A. Herring

3:25 Closing Remarks.

WALC
3121
Addressing the needs of the non-chemistry majors in general education courses

G. Crawford, K. D. Kloeppe, Organizers, Presiding

8:00 Introductory Remarks.

8:05 37. Kitchens as laboratories: A distance education food chemistry course for non-science majors. G. Crawford

8:25 38. Say “Fromage”: Tales from a General Education Study Travel Science Course Focused on the Science of Cheese. J.L. Hawk

8:45 39. Using historical context to teach science process in a non-major’s physical science general education course. L. Demoranville

9:05 40. “Chemistry of Soap”: A non-science majors lab-based course at Georgia Gwinnett College (GGC). I.H. Krouse

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 41. Engagement of non-chemistry majors through a citizen science service-learning project. K.D. Kloeppe, L. Simon

11:25 42. Creating real-life case studies for a non-majors chemistry and environment course.. A.N. Oldacre

11:45 43. Small Molecules Big Ideas at Riverview Correctional Facility. J. Schmeisser, S. Glazier

12:05 Panel Discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.
2:05 44. Meeting students where they are: Intentional design for non-majors' chemistry courses in an interdisciplinary general education program. R.E. Grote, C.J. Hayes, B. Ramos

2:25 45. Engaging non-majors through a self-selected reading challenge. E. Vickers


3:05 47. Encouragement-Based Assessment: Grading by Points Rather Than Percentage. J.A. Suchocki

3:25 Closing Remarks.

3:30 Break.


3:50 48. Chemical Literacy in Senior Students. L.Y. Nabulsi

4:10 49. Infusing chemistry concepts into interdisciplinary global challenges general education coursework: A Clemson University case study. B.G. Trogden, E.A. Boyd

4:30 50. Culinary Reactions - A home cooking lab course. J. Schmeisser

4:50 Panel Discussion.

5:10 Closing Remarks.

STEW
302

Blended instruction design and assessment: Leveraging technology to promote adaptive learning for college chemistry

M. Blaser, J. Chamberlain, J. J. Stewart, D. Yaron, Organizers, Presiding
8:00 Introductory Remarks.

8:05 64. Building student confidence and improving performance through scaffolded practice in a hybrid learning environment. **W. Lampart, B. Bekker, M. Motika, R. Tang**

8:25 65. Using technology to promote student metacognition in general chemistry. **T.M. Clark**

8:45 66. Improving learning in general chemistry via interactive courseware: Instructor perspectives. **M. Blaser, M. McCarthy, J. Vincent**

9:05 Panel Discussion: Instructor Use of Open Learning Initiative Courseware.

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 67. OLI General Chemistry Courseware Data Analysis. **S. Raysor**

11:25 68. Learning about the process of learning from logs of student interactions with online resources. **D. Yaron, S. Raysor, M. Blaser, D. Doshi**


12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 71. Artificial intelligence transcript analysis to support instructor reflection and measure change. **J. Chamberlain, M. Blaser, M. Steinwachs, M. Molinaro**

2:45 73. Improve learning in general chemistry via interactive courseware: Building a community of practice. **T. Shelton**, D. Doshi, M. Blaser

3:05 Panel Discussion: the AHA! Chemistry Project.

3:25 Closing Remarks.

3:30 Break.


3:50 74. Curation and creation of open educational resources - An experiment in teaching undergraduate chemistry. **G. Shridhar**, L. Ravishankar

4:10 75. Using PhET Simulations to Promote Concept Development in General Chemistry: Are They Efficacious in an Independent Online Setting?. **J.F. Eichler**, K. Atit, L. Ye, M. Casselman, C. Murphy

4:30 76. Exploring a Simulation on Atomic Structure Before Lecture Improves Undergraduate Chemistry Students’ Concept Learning. **A.M. Powe**, D.B. Franco, D. McClellan, R. Chastain, J. Hieb, L. Fuselier, M. DeCaro

4:50 77. No chemist left behind: leveraging virtual experiments for student engagement and retention. **T. Shelton**

5:10 Closing Remarks.

STEW
306

**C.O.V.I.D.: Carrying Over Valuable Innovative Developments**

E. G. Malina, Organizer, Presiding
8:00 Introductory Remarks.

8:05 78. Making the Most of Crises: Using Remote Learning to Refine Lab Analysis Goals. S. Block, L. Gustin, C. Wilkinson

8:25 79. Learning from the Pandemic: Engaging students through remote access to instrument software in an advanced CURE instrumentation laboratory course. G. Rabah

8:45 80. Developing a virtual chemistry lab framework with post-pandemic relevance in mind. V.S. Vyas


9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 82. Using activities and explorations and capstone assignments as innovations in a general chemistry course for non-majors. M.H. Towns, C.J. Harwood, C.E. Wright

11:25 83. Second chance General Chemistry I developed as an online, short-term course. A.B. Ormond

11:45 84. Investigating student perception of course materials developed during the pandemic for introductory STEM courses. B. Chiu, N. Lapeyrouse


12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 86. Keep it or leave it: COVID-19-induced changes in my teaching. K.S. Craig

2:25 87. Research informed instructional design for remote teaching results in better student success for face-to-face classes. D.G. Herrington, R.D. Sweeder

3:05 Panel Discussion.

3:25 Closing Remarks.

3:30 Break.


3:50 89. Remote teaching of organic chemistry in two large-enrollment courses over four semesters. V. Iosub

4:10 90. Using Google Docs for Real-Time Collaborative Group Work during Virtual Lectures. A.R. Babij

4:30 91. How using an ELN to manage lab courses differs from using an LMS alone. H. Arman, F. Yoshimoto

4:50 Panel Discussion.

5:10 Closing Remarks.

WALC
B058

Chemistry Education Research: Graduate Student Research Symposium

M. Connor, O. Crandell, Organizers, Presiding

8:00 Introductory Remarks.

8:05 92. A novel approach to purposive sampling when mixed quantitative and qualitative criteria are used for participant selection. K.Q. Magnone, E.J. Yezierski
8:25 93. Facilitation practices of learning assistants in remote versus in-person settings. N. Maggiore, J. Karch, I. Caspari

8:45 94. The Authoritative-to-Dialogic Spectrum of Learning Assistant Facilitation Practices. C.M. Carlos, N. Maggiore, V. Dini, I. Caspari

9:05 95. Teachers as learners: professional development with storyboarding and molecular-level phenomena. J. Ebert, E.J. Yezierski

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 96. Withdrawn

11:25 97. General chemistry instructors’ intentions for and evidence of student learning from external representations of acid-base titrations. N. Baldwin, M. Orgill

11:45 98. Assessing the impact of a Master’s in Chemistry program on pedagogical content knowledge change in high school science teachers. M. Bautista, M.L. Miller


12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 100. Investigating faculty perceptions of the role of energy and electrostatic/bonding interactions in the context of reactions within their course. A. Roach, Z. Roche Allred, B. Adams, S.M. Underwood

2:25 101. Chemical Literacy Changes in General Chemistry and Organic Chemistry Students. L.Y. Nabulsi

2:45 102. Investigating the structure of students' organic chemistry knowledge. S. Abeywardana, M. Cooper
3:05 103. "That's Phenomenal!: The Translation of Phenomena-Based Learning to Postsecondary Introductory Chemistry as an Entry Point to Causal Mechanistic Reasoning. L. Scharlott, D. Rippey, N.M. Becker

3:25 Closing Remarks.

3:30 Break.


4:10 105. The Laboratory as a Vehicle for Argumentation Enhancement among Pre-Service Teachers of Science Education. M. Hugerat

4:30 106. Exploring Post-Secondary Chemistry Instructor’s Resources for Planning Instruction. R. Fantone, G.V. Szymczak Shultz

4:50 107. Using the dynamic transfer framework to explore chemistry students’ interpretations of the first law across disciplinary contexts. A.P. Parobek, P.M. Chaffin, M.H. Towns

5:10 Closing Remarks.

WALC
B093

Disrupting Grading

D. A. Barr, K. D. Closser, R. D. Link, J. L. Muzyka, J. R. Ring, C. Sorensen-Unruh, Organizers

8:00 Introductory Remarks.

8:05 125. Chemistry Coins: A Grading System Based on Bloom’s Taxonomy in an Inorganic Chemistry Course. K. Young
8:25 126. Quantized grading: An ab initio approach to using specifications-based grading in physical chemistry. **K.D. Closser**, M.J. Hawker, H. Muchalski

8:45 127. Implementation of specifications grading in an online forensic science quality assurance course. **T. Legron-Rodriguez**, C. Randles

9:05 128. Help, I’ve been Chegged! Understanding academic integrity in the chemistry classroom. **B.K. DeKorver**, D.G. Herrington

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 129. An implementation of mastery-based grading based on Marzano's Taxonomy in large-enrollment general chemistry. **S. Garrett-Roe**, T.D. Shepherd

11:25 130. An alternative grading strategy in a General Chemistry I classroom. **J. Haile**


12:05 132. On the quest to improve student learning in general chemistry lecture using a competency-based approach before and during COVID. **B.E. Taylor**

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 133. Shifting the focus away from points: A year of alternative grading in large-enrollment General Chemistry lab. **K.A. Gesmundo**, V.M. Berns

2:25 134. Using specifications grading to enhance scientific writing in a general chemistry II lab. **E. Wachter**

2:45 135. Specifications grading by a scared first-timer in general chemistry. **W. Kennerly**

3:25 Closing Remarks.

3:30 Break.


3:50 137. Ungrading for Meaningful Chemistry Learning. **J. Brown**


4:30 139. Ungrading in Environmental Toxicology and General Chemistry. **C.M. Woodbridge**

4:50 140. Lessons learned from ungrading the general chemistry classroom at a primarily undergraduate institution. **T.E. Alivio**

5:10 Closing Remarks.

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**Effective Graduate Education for Masters and Doctoral Chemistry Students**

J. Harshman, G. V. Szymczak Shultz, *Organizers, Presiding*

8:00 Introductory Remarks.

8:05 141. Critical challenges to chemistry doctoral education in the United States. **J. Harshman**

8:25 142. Investigating how chemistry graduate students develop and engage in the use of scientific practices within their research. **B. Martinez**, Z. Roche Allred, P. Alvarez, S.M. Underwood
8:45 143. Factors which predict the perceived value of a seminar talk. E.W. Kelley

9:05 144. Professional identity: Catalysis in the synthesis of chemists. G. Bhattacharyya

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 145. Graduate School Experiences in the Chemical Sciences: Student Views and Implications for Change. J. Stockard

11:25 146. Mentorship needs for chemistry students and early career researchers. E.W. Kelley

11:45 147. Investigation of Advisor-Advisee Conflict Communication in U.S. Chemistry Graduate Education. T. Qu, J. Harshman

12:05 148. Focus groups with chemistry graduate students from English-additional language (Eng+) backgrounds. J.M. Deng, A.B. Flynn

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 149. The ACS Bridge Program: Enhancing diversity, equity, inclusion, and respect in graduate education in the chemical sciences. J. Schlatterer


2:45 151. Preparing chemistry graduate students for careers in industry and national labs: An innovative and holistic training model. S.E. York

3:05 152. Effective graduate training in soft skills with a full-day professional development workshop. S. Lim, V. McLaughlin, C. Patterson, R. Richardson, J. Goodey Pellois, C. Hilty, M. Harthcock
3:25 Closing Remarks.

3:30 Break.


4:50 156. Chemistry education research group culture and individual student growth: Toward best practices in management and development. E.J. Yezierski

5:10 Closing Remarks.

WALC
B066

Engaging Students in Organic Chemistry: A Symposium to Honor Barbara Murray

P. J. Kreke, B. Murray, Organizers, Presiding

8:00 Introductory Remarks.

8:05 157. Colorful polymers. C.F. Hermann, C. Burke

8:25 158. Engaging organic chemistry students through projects that address green chemistry principles. D.C. Bromfield-Lee
8:45 159. Engaging students in interpreting NMR spectra with metacognition. L.J. Martin

9:05 160. Scaffolding organic chemistry laboratory: Start with experiments. M. Turon, L. Ahlberg

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.


11:25 162. Teaching scientific thinking through writing to learn: Give your students CPR. B. Burlingham

11:45 163. 'My Favorite Drug': Exploring connections between organic chemistry and medicine. A.V. Aditya

12:05 164. Developing video games to communicate organic chemistry concepts. S.G. Sogo

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 165. Reading assignments and term projects in Honors organic chemistry. C. Stephens, S. Davis, S.A. Dandekar

2:25 166. Adapting problem solving activities for enhancing students’ conceptual understanding in organic chemistry. G. Shridhar, L. Ravishankar

2:45 167. Integrating the preparation of biomolecules and pharmaceutical drugs in teaching undergraduate Organic Chemistry: Examining electrophilic and nucleophilic aromatic substitution in the synthesis of thyroxine. N.C. Kallan, S.N. Mahapatro

3:05 168. Teaching a literature-based advanced organic chemistry course at a primarily undergraduate institution. D.L. Silverio, M.J. Mistretta, S.P. Buzzolani
3:25 Closing Remarks.

3:30 Break.


4:10 170. Supporting remote learners with an electronic whiteboard. P.M. Morgan

4:30 171. Helping organic chemistry students generate the right questions: A blend of online homework and written problem sets. J.M. Karty, R. Jew

4:50 Panel Discussion.

5:10 Closing Remarks.

BRWN
1154

Engaging Students in Physical Chemistry

D. E. Gardner, C. M. Teague, Organizers, Presiding

8:00 Introductory Remarks.

8:05 172. Lessons learned in the conversion of a flipped physical chemistry course sequence to a Hyflex format. L.M. Goss

8:25 173. Student posters as a way to modernize the PChem Lab when new equipment is not an option. J. Monahan

8:45 174. Oral exams: A useful tool to help your students learn physical chemistry better. D.E. Gardner
9:05 175. Non-traditional approaches to curricula, assessments, and personal growth in the physical chemistry classroom. **A.N. Giordano**

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 176. Integrating computational modeling in physical chemistry laboratory. **H.L. Berghout**, M.J. Perri

11:25 177. Game: Quantum Particle-in-a-Sandbox. **D.V. Chulhai**


12:05 Panel Discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.


2:25 180. Engaging students in physical chemistry using Python and Jupyter notebooks to target conceptual, mathematical, and graphical reasoning. **K. Tibbetts**, S.S. Hunnicutt


3:05 Panel Discussion.

3:25 Closing Remarks.

3:30 Break.

3:50 182. Encouraging student engagement in scientific practices through a gas-phase IR POGIL physical chemistry laboratory experiment. J. Beck, D.M. Miller

4:10 183. Withdrawn

4:30 184. Estimating $\lambda_{\text{MAX}}$ for conjugated dye systems with a finite well quantum mechanical approximation. D. Catlett

4:50 185. Dynamical and statistical monitoring of temperature and pressure in the measurement of the heat capacity ratio by adiabatic expansion. D. Catlett

5:10 Closing Remarks.

WALC
3090

Faculty Experience with Course-based Undergraduate Research Experience (CURE)

K. J. Ho, Organizer
J. L. Stafford, T. Terry, Presiding

8:00 Introductory Remarks.

8:05 194. Course-based Research Experiences for High School Students: Start Early, Repeat Often. T. Terry

8:25 195. A pre-CURE implementation in a large General Chemistry lecture course. D. Habel-Rodriguez, K.J. Ho

8:45 196. Development of a team taught, first year course based undergraduate research experience at the interface of biology and chemistry. L. Knecht, J. Van Dyken

9:05 Panel Discussion.

9:25 Closing Remarks.
9:30 Break.

11:00 Introductory Remarks.

11:05 197. Exploring the frontiers of chemistry: A research methods course at a diverse, urban, R1 university. K. Tibbetts, L. Waller, M. Smith


11:45 199. Iteration of a CURE for biochemistry II lecture. E. Ragan

12:05 Panel discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 200. Teaching Next Generation Chemists: How to Prepare Lab Instructors/TAs to Teach CURE. J.L. Stafford


2:45 202. Design and implementation of a graduated approach to an independent instrumental analysis project. T. Thomas-Smith


3:25 Closing Remarks.

3:30 Break.


3:50 204. Implementing course based undergraduate research experiences that bridge coursework between the spectroscopic identification of organic molecules and inorganic chemistry labs: A survey of three offerings. W. Carroll, E.C. Lisic
**From the bench to the desk to the bench: Experiences developing and implementing an inorganic chemistry CURE during COVID-19.**  
**E. Victor**

**Comparing different modality of CURE and their effects on student’s learning.**  
**K.J. Ho**

**Panel Discussion.**

**Closing Remarks.**

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**George R. Hague Memorial AP/IB Chemistry Symposium**

L. Cummings, P. D. Price, *Organizers, Presiding*

**Introductory Remarks.**

**8:05 214. Inner Strength: Why do acids break up?.**  
**K.L. Hendren**

**8:25 215. Kinetics Activities that Promote a Particle Collisions Point of View.**  
**A. Snyder**

**8:45 216. Just a droplet in the bucket of AP Chemistry; equilibrium, acid/base reactions, and thermodynamics all in one microscale chemistry experiment.**  
**R. Johnson**

**9:05 217. Claim Evidence Reasoning (CER) in the AP Chemistry Classroom using a Smartphone Spectroscopy Beer's Law and Rate Law Experiments.**  
**A. Schmidt**

**Closing Remarks.**

**9:30 Break.**

**11:00 Introductory Remarks.**
11:05 218. Pattern Investigations in AP Chemistry. J. Brown


11:45 220. AP Readiness: an access and equity program. M.A. Morgan

12:05 221. Implementing best practices to improve scores on the AP Chemistry exam. J. Benigna

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 222. College Board resources and updates for AP Chemistry. J. Benigna

2:25 223. Review of the 2022 AP Chemistry Exam. K.A. Beran, J. Benigna

3:25 Closing Remarks.

3:30 Break.


3:50 224. Q&A with Chief Reader, Development Committee, and College Board. K.A. Beran, J. Benigna

5:10 Closing Remarks.

WALC
3138

Innovations and Experiences In the Chemistry Classroom During the First Two Years
T. B. Higgins, Organizer, Presiding

8:00 Introductory Remarks.

8:05 237. Particular Meaning. B. Ratcliff

8:25 238. STEM Based Cross-Curriculum Modules to Enhance Student Engagement and Learning. R. Bright, T. Holmes, C. Dodd

8:45 239. ‘Mole of reaction’: Using units consistently in general chemistry. D.Z. Keifer, D. Rieck

9:05 240. The Use of Analogies in General and Organic Chemistry Courses. B.E. Love

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 241. Adopt a Chemical Substance: Explore How General Chemistry Topics Are Cross-linked. R. Zhang

11:25 242. Using the flipped classroom in first year general chemistry courses at a community college. S. Stegall

11:45 243. Student generated connections to chemistry content to enhance interest in introductory chemistry. M. Hands

12:05 244. Mobile Technology in the Chemistry Classroom: Do students think it’s worth surpassing the activation barrier?. B. Baldock, A.L. Fernandez

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 245. Uniting Chemical Concepts Using Ocean Acidification in a General Chemistry 2 Course. C.S. Haslag
2:25 246. Using scientific literature to increase students’ understanding of what it means to be a scientist. **J.M. Liu, A. Perla, S. Hollar**

2:45 247. Implementation of Pop Quizzes as an Inclusive Teaching Tool in General Chemistry. **E. Johnson**

3:05 248. VSEPR flat packs. **K. Rust**

3:25 Closing Remarks.

3:30 Break.


4:10 250. How an EDI in STEM Community of Practice prompted a successful change in General Chemistry discussion activities. **A.J. Kabrhel**

4:30 251. How do undergraduate students solve a neutralization reaction problem before and after instruction?. **N.M. Dickson- Karn, T.M. Clark**

4:50 252. What to do about the Henderson-Hasselbalch equation?. **N.M. Dickson-Karn, T.M. Clark**

5:10 Closing Remarks.

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**Integrating Green Chemistry and Sustainability into Chemistry Education**

L. Bastin, A. P. Dicks, *Organizers, Presiding*

8:00 Introductory Remarks.

8:25 254. Greening the high school classroom through a hands-on collaborative workshop. J.E. Wissinger, C.K. Lydon, C. Javner

8:45 255. Re-orienting preservice chemistry teachers towards sustainability and its integration. R. Hanson, C. Hanson

9:05 256. Effects of the use of standard and alternative materials in acid/base titration on secondary school chemistry students’ achievement and attitude towards environmental sustainability. F.I. Umanah, T.E. Owoyemi

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.


11:45 259. Integrating the tenets of green chemistry in gateway chemistry courses through an incremental approach in order to facilitate deeper understanding and retention. D.A. Laviska

12:05 Panel Discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.


3:05 263. Sustainable Catalysis Research through an Integrated Chemistry Laboratory Course. **o. villanueva**

3:25 Closing Remarks.

3:30 Break.


4:10 265. Addressing Environmental Racism in through Community and Political Engagement in Chemistry Courses. **L. Bastin**, A. Martin

4:30 Panel Discussion.

5:10 Closing Remarks.

WALC
3127

**Teaching in the chemistry laboratory: Beyond confirmatory experiences**

B. M. Neal, D. J. Styers-Barnett, K. Weber Stickney, *Organizers, Presiding*

8:00 Introductory Remarks.
8:05 278. A Two Week Model for Introducing Guided Inquiry into General Chemistry Lab. V. Fringer, K. Mandery, T. Bibelnieks, J. Wainman

8:25 279. Physical Sciences Research Experience – a model for co-designing lab experiences with students, for students. K. Kim, E. Sauer, S. Mikhaylichenko

8:45 280. Argument driven inquiry for introductory chemistry students. M. Hands

9:05 281. Development of a Chemistry Laboratory Course for Online Instruction. C. Schrank, S. Post, K.J. McKnelly

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.


11:45 284. Training Tomorrow’s Scientists: Lessons Learned from Embedding Professional Skills into a Guided Grant and Laboratory Project. D.J. Styers-Barnett, A.N. Giordano


12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 286. Community garden field experiences as a means to reduce anxiety and increase self-efficacy. E.L. Lebeau


3:05 289. What's in the water?: Using real world water samples in the teaching laboratory. N.A. Law, B.L. Brabetz, J.T. Sprague

3:25 Closing Remarks.

3:30 Break.


3:50 290. From synthesis and analysis to elucidating steric and electronic effects: An acyl substitution organic chemistry lab. J.P. Moerdyk

4:10 291. A research-based capstone project for sophomore level organic chemistry lab. C.S. Bagwill, B. Woods, I. Brown

4:30 292. Shedding light on organic synthesis: A supplemental spectroscopy course to accompany Organic Chemistry 2 Laboratory. K. Weber Stickney, L.H. Mielke

4:50 Panel Discussion.

5:10 Closing Remarks.

WALC
1055

Assessment and Measurement in Research and Practice

K. L. Murphy, J. R. Raker, Organizers, Presiding

8:00 Introductory Remarks.

8:05 51. Insight into student reasoning using online reasoning chain construction assessments (ORCCA). M.L. Nagel, B. Lindsey


9:05 54. Variations in Assignment Expectations as Represented by Rubric Structure and Content in General Chemistry. M. Herridge

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 55. Labflow: Using big data to trace and assess laboratory skills. D. DeSutter

11:25 56. Do We Ask Students to Do What We Want Them to Learn? An Investigation of the General Chemistry Laboratory Course. E.M. Duffy, A. Kreps, A. MacNeil

11:45 57. Comparing proctored in-person exams with unproctored online exams in general chemistry: Performance, security, and perspectives of students and faculty. D.A. Turner, T.M. Clark

12:05 Panel Discussion.

12:25 Closing Remarks.

STEW
218ABCD

Biochemistry Education: Discussions of the Laboratory Learning Environment

S. Johnson, Organizer, Presiding
8:00 Introductory Remarks.

8:05 58. Imaging single molecules of Annexin V binding to membranes in an undergraduate physical biochemistry lab course. **J.D. Knight**, N. Alansari, D.T. Giardina, T.N. Huynh

8:25 59. Designing a Western Blot Method Optimized for the Time Constraints of a Biochemistry Teaching Laboratory. **S. Katner**, C. Krois

8:45 60. 39andWoof: Canine breed determination using DNA microsatellite analysis. D. Punthrankul, **K.R. Willian**

9:05 Panel Discussion.

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 61. Modernizing the Biochemistry Lab Experience: A Blended Computational and Experimental Biochemistry CURE. **E. Reynolds**

11:25 62. Reimagining an established CURE to provide high-quality digital learning experiences that are intentionally equitable, inclusive and accessible for all students. **A. Sikora**, B. Hall, S. De, P.A. Craig

11:45 63. Does the use of an Integrated Lab Notebook in an Undergraduate Biochemistry Laboratory Increase Student Understanding?. **S. Katner**, C. Krois, J.R. Pribyl

12:05 Panel Discussion.

12:25 Closing Remarks.

WALC
1132

Chemistry education research at a crossroads: Where do we need to go now?
D. G. Herrington, *Organizer, Presiding*
O. Crandell, R. D. Sweeder, *Presiding*

8:00 Introductory Remarks.

8:05 108. Moving along the pandemic response continuum from survival towards intentionality. **M. Cooper, T. Holme**

8:25 109. Blurring the lines: Embracing intersectionality within (and beyond) the biochemistry education community. **T.J. Bussey, E. Offerdahl**

8:45 110. Broadening relevance, dissemination, and impact of Chemistry Education Research. **V. Talanquer, P.G. Mahaffy**

9:05 111. Promoting high quality chemistry education research. **O. Crandell, D.G. Herrington, R.D. Sweeder**

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 112. How do we define effective practice in chemistry education and how do we get people to use it?. **B. McCollum, G. Rushton**

11:25 113. Envisioning an education research community invested in racial equity. **S.F. Bancroft, V.R. Ralph**


12:05 115. Implementing effective chemistry education practices. **R.D. Sweeder, D.G. Herrington, O. Crandell**

12:25 Closing Remarks.
Extended Reality in Chemistry Education

L. Wright Ward, *Organizer*
E. Echeverri, *Presiding*

8:00 Introductory Remarks.

8:05 186. Interdisciplinary collaboration: The key for a successful immersive educational experience. **D. Venegas, H. Gutiérrez**

8:25 187. Mobile Augmented Reality: a new way to train in the chemical lab!. **j. dominguez alfaro, P. Van Puyvelde**

8:45 188. Using Augmented and Virtual Reality to Enhance Students’ Visualization and Understanding of Molecular Structures. **S. Dalili, M. Abdinejad, H. Qorbani**

9:05 189. Eye tracking and AR in an experimental setting. **S. Syskowski, J. Huwer**

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 190. Development and Exploration of a Virtual Reality Learning Environment (VRLE) build around a novel model to extract, represent, and predict Cycloaddition Reactions. **E. Echeverri, M. Oliver-Hoyo**


12:05 193. Withdrawn

12:25 Closing Remarks.
Favorite half-hour lab experiments

G. Lisensky, Organizer, Presiding

8:00 Introductory Remarks.

8:05 207. A Quick and Easy Electroless Deposition and Alkanethiol Treatment to Form a Superhydrophobic Surface. G. Lisensky

8:25 208. Measuring the molar mass of air. D.J. Campbell

8:45 209. Beaker batteries: Making electrochemical cells to better understand battery chemistry and components. L.J. Lyons

9:05 210. Identifying Solutions by Chemical Properties. L. Hansen

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 211. Demystifying source modulation-lock-in amplification in chemical instrumentation: a short experiment. L.R. Sharpe


11:45 213. A Series of NGSS Aligned Acid-Base Chemistry Activities for Second Grade Students. A. Alveshere, R. Waterman

12:05 Panel Discussion.

12:25 Closing Remarks.
Well that's interesting! Emergent results, unexpected findings, and new areas for research

M. Herridge, N. M. James, *Organizers, Presiding*

8:00 Introductory Remarks.

8:05 305. Leveraging Social Comparisons: an Exploratory Study of How Students Self-Evaluate in Peer Review Settings. *S. Berg, A.C. Moon*

8:25 306. The Lemonade Tastes Good: Co-teaching the Methods Course for the Benefit of the Students. *J.R. Pribyl, L.A. Senden*

8:45 307. A Side Trip into Work orientation and Chemistry Teacher Longevity: What the Covid-19 pandemic might have to teach us. *S.B. Boesdorfer*

9:05 308. How Prompt Iteration Can Affect Student’s Explanations of an Intramolecular Reaction Mechanism. *S. Houchlei, M. Cooper*

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.


11:25 310. Online Learning and study habits: Perspectives from three universities in Spain and the UK. *S. Fergus, A. Notario, Y. Diaz, R. Blackburn, D. Williams*

11:45 311. The forgotten materiality of chemical education: A research and teaching opportunity. *D.J. Wink*

12:05 Panel Discussion.
12:25 Closing Remarks.

PMU
North Ballroom

General Posters 1

M. T. van Opstal, Organizer, Presiding

9:30 - 10:30

312. Teaching Chemistry Outside of the Text. D. Ventura

313. Chemical composition of copper-tin-aluminum alloys from a system of three equations in three variables via non-destructive sample analysis. A. Van Sertima, S. Simmons, R. Zablah-Vasquez, A. Villalta-Cerdas

314. Emphasizing Student success with /collaborative Learning Strategies Utilizing the Study cycle in a Hybrid General Chemistry I Course. M.H. Benko

315. Withdrawn

316. Case Studies of Using McGuire’s “Teach Students How to Learn” Intervention to Successfully Decrease DFW Rates in General Chemistry I. S.R. Trevino

317. Encouraging Argumentation on Chemistry Education with an Interrupted Case Study. M. Silva de Lima, D. Gomes Lima dos Santos, S. Queiroz

318. Computational chemistry assisting the identification of polymers. C. Salter

319. Flipped Classroom Approached in Chemistry Classes. R.S. Perera

320. The Improvements for Interpretation of the Law of Definite Proportions in Science Textbooks in Korea. H. Kim, H. Lee


323. How does problem-solving with organic chemistry molecules literally look like?. A. Langner, N. Graulich


327. Introducing Postdoctoral Scholars to Careers at Primarily Undergraduate Institutions through a Visiting Seminar Program. J.E. Mihalick, E. Winterrowd

328. Active Learning Approaches in Large Enrollment Organic Chemistry Course. A. Frantz

329. Specifications Grading as a Catalyst for Mastery Learning in Organic Chemistry Courses. D.T. Fujito


331. Demonstrating bacterial resistance to antibiotics. D. Marous, C. DeWeese, R. Boyette

332. Using the M-ASSIST (modified approaches and study skills inventory) to probe student study-related behaviors. J.N. Orvis, E. Johnson

333. The ACS Committee on Community Activities (CCA): Resources for outreach and public engagement. L.R. Stepan, W.J. Doria

334. Development of Interactive Tutorials to Improve Course Outcomes in a High-Enrollment General Chemistry Course. E. Olson, T.L. Vickrey, M.A. Griep, M. Balabanoff, J.A. Kautz, E.G. Malina

335. Do case studies help students understand the relevance of chemistry?. A. Glass

336. A card game for reviewing chemical instrumentation. K.K. Cline
337. Contemporary Chemists Project. R.C. Dudek

338. The corundum rainbow: Designing a computational experiment as an introduction to solid state chemistry. S. Parrott

339. Chemists as voters: Pedagogical strategies to improve student democratic participation. B.G. Trogden

340. An Inquiry-Based Comparative Analysis of Salt Content in Food for Quantitative Analysis Laboratory. E.M. McCorquodale, K. Fogarty

341. Laboratory Report Scaffolding. K. McElhoney

342. Context Matters: Evaluating the effects that integrating context into POGIL curricula had on students achieving content proficiency in a general chemistry course. G.D. Ibarrola Recalde, D. King


344. A Workshop CURE: The UIC STEM Initiative CoLab Program. A. Wierzchowski

STEW
206

Engaging Students in Analytical Chemistry - Classroom Practices and Learning Environments

L. Mier, M. Queen, Organizers, Presiding

11:00 Introductory Remarks.

11:05 345. Effects of modalities on student performance in an introductory analytical chemistry course. E. Kwong

11:45 347. Take-Home Examinations for Analytical Chemistry Courses to Evaluate and Enhance Learning. A. Jacobs

12:05 348. Equity is paramount: making analytical chemistry accessible to blind and vision impaired students. A.M. Palmer, A.A. Hill

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 349. Build a Spectrometer Lab: Construct and characterize a spectrometer with interchangeable parts. A.D. Gift, J.A. Godek

2:25 350. Tis the Season for Measuring pH in a Project-Based Quantitative Analysis Course. M. Queen

2:45 351. Incorporating scientific instrumentation design into the Analytical Chemistry curriculum. B.J. LeSuer


3:25 Closing Remarks.

3:30 Break.


3:50 353. Choose Your Own Adventure in the Instrumental Analysis Laboratory. K.H. Fogarty, E.M. McCorquodale


4:30 355. Leveraging Pack Mentality to Unleash Student Engagement in Instrumental Analysis. K. Proctor

5:10 Closing Remarks.

STEW 311

Research Investigations in STEM Identity in Chemistry Learning Environments

J. H. Carmel, M. L. Head, Organizers, Presiding

11:00 Introductory Remarks.

11:05 357. Validation and pilot use of social capital and chemistry identity survey instruments at a Hispanic-serving institution. G. Castano

11:25 358. Characterizing power structures: using positionality theory to develop a chemistry classroom observation protocol. G. Castano

11:45 359. Dimensionality of Sense of Belonging in First-Year Chemistry Students. J. Young, S.E. Lewis

12:05 Panel Discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 360. Exploring the relationship between a student’s STEM professional identity and their perception and performance in the chemistry laboratory – An analysis across the chemistry curriculum. M.L. Head, G. Taasoobshirazi, K.J. Linenberger Cortes, D. Dayani

2:45 362. Post-Secondary URM STEM Students’ Perceptions of Their Science Identity. S. Nealy, M. Orgill

3:05 Panel Discussion.

3:25 Closing Remarks.

3:30 Break.


3:50 363. An S-STEM cohort and activities to foster scientist identity and sense of belonging in chemistry and biochemistry majors. M.G. Grunert Kowalske, J.M. Ribble

4:10 364. Using Pen Pals to Normalize Struggle in General Chemistry. K. Reiser, M. Weinrich

4:30 365. Understanding the experiences of marginalized women pursuing doctoral degrees in chemistry. T. Jones, J.M. Pratt, M. Popova

4:50 Panel Discussion.

5:10 Closing Remarks.

WALC
2051

Teaching Chemistry through Art and Archaeology

K. L. Braun, K. Jansen Labby, Organizers, Presiding

11:00 Introductory Remarks.
11:05 366. Using Art and Archaeology to Demonstrate the Chemistry of Materials in a General Education Course. J.E. Mihalick

11:25 367. Taking the Show on the Road: Leveraging Study Abroad to Enhance the Chemistry and Art Curriculum. M.J. Samide, A.M. Wilson

11:45 368. Development of learning objectives for a science of art course for non-science majors. B.G. McBurnett

12:05 Closing Remarks.

12:10 Lunch.

1:40 Introductory Comments.

1:45 369. Dyeing to Learn Chemistry: Fibers and Dyes in the Chemistry Classroom. A.H. Gorensek-Benitez

2:05 370. Curricular Materials on the Chemistry of Pottery, Including Thermodynamic Calculations for Redox Reactions in the 3-Stage Firing Process of Athenian Black- and Red-Figure Vases Produced from the Sixth-Fourth Centuries BCE. C. Vyhnal

2:25 371. The Cultural Heritage Science Open Source (CHSOS) database of analytical spectra from archaeological and historical pigments: a free and fun chemistry instructional tool for use in 'chemistry of archaeology and art' courses. C. Vyhnal


3:05 Closing Comments.

3:10 Break.

3:25 Introductory Comments.

3:30 373. Technical Analysis of Paintings Course and Museum Exhibition. K. Jansen Labby, C. Story

3:50 374. Chemistry and Art: An Inquiry Based Travel Course for Non-Science Majors. C. Theodore
4:10 375. Using art and archaeology collections to encourage students to find their own voice in the chemistry communication. **P.K. Jue**

4:30 376. Integrating Archaeology and Interdisciplinary Collaborations with Museums throughout the Undergraduate Chemistry Curriculum. **K.L. Braun**

4:50 Panel Discussion.

5:10 Closing Comments.

T**eaching Large Classes**

A. Paterno, *Organizer, Presiding*

11:00 Introductory Remarks.

11:05 377. Creating an Environment for Engaging Students in a Large Chemistry Class. **Q. Liu**


11:45 379. Don't drown in resources: know where the lifevest is. **S.M. Taylor**

12:05 380. Varying the timing of content introduction to enhance student performance in undergraduate general chemistry. **A. Howcroft**, D. King

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.
2:05 381. Using the Chem101 app to Enhance Active Learning in General Chemistry. A. Paterno

2:25 382. The role of TA mentors in training graduate TAs for large General Chemistry lecture courses. M.J. Bojan, L. Funari

2:45 383. Lessons Learned from “flipping” a large-lecture, General Chemistry Course. A.M. Powe

3:05 384. The Use of Technology and Team Teaching in a Large Lecture. T. Hidalgo

3:25 Closing Remarks.

3:30 Break.

3:45 Introduction.

3:50 385. Making a large-enrollment class feel smaller: Design and implementation of a new model for introductory chemistry. K. Welch, L.M. Columbus, G. Hunger

4:10 386. Assessment and structural strategies for a very large enrollment (1000+), online-only introductory chemistry course. E. Pelton

4:30 Panel Discussion.

5:10 Closing Remarks.

BRWN
3102

Community-Based Learning in Chemistry: Implementation, Best Practices, and Evaluation

Y. K. Gorske, Organizer
E. Lesher, Presiding

2:00 Introductory Remarks.


2:45 389. Implementing Environmental Science in Service-Learning Class. K.M. Deavers, A. Cutler


3:25 Closing Remarks.

3:30 Break.


3:50 391. Student perceptions of chemistry service-learning opportunities across multiple semesters. K.A. Bowe, A.R. Green, E. Lesher, Y.K. Gorske, C.F. Bauer

4:10 392. Undergraduate Instructional Resources for Performance of Chemical Demonstrations. J.W. Dumm


4:50 394. Sustainable partnerships with community partners in a service-learning chemistry curriculum. K. Post, E. Lesher

5:10 Closing Remarks.

STEW

204

COVID Keepers: Positive lessons learned from the pandemic
M. A. Erdmann, Organizer, Presiding

2:00 Introductory Remarks.

2:05 395. From an emergency pandemic course to an online course: A General Chemistry course in a resource constrained HSI case study. K. Davila-Diaz

2:25 396. Lessons learned transitioning High Structure Active Learning (HSAL) in General Chemistry from in-person to remote and back again. A. Curtis, C. Bliem

2:45 397. Comparing performance disparities in general chemistry courses taught online and in-person. T.M. Clark

3:05 Panel Discussion.

3:25 Closing Remarks.

3:30 Break.


3:50 398. Fact or fiction: Lessons learnt from teaching high school chemistry online. S. Akaygun, S. Celik, F.O. Karatas

4:10 399. Pandemic-related gaps in foundational knowledge normally acquired in introductory chemistry courses. S. Srinivasan

4:30 Panel Discussion.

5:10 Closing Remarks.

STEW
307

Designing and Implementing Chemistry Learning Environments that Support Students in Connecting Molecular Behavior to Phenomena
T. M. Kuborn, C. Schwarz, R. Stowe, *Organizers*
A. Schafer, *Organizer, Presiding*

**2:00** Introductory Remarks.

**2:05 400.** What Are We Saying? A Self-Critical Analysis of the Messages Communicated by Reformed Curricular Materials. **A. Schafer**, R. Stowe

**2:25 401.** Chemistry Students Development and Revision of Models to Explain Phenomena. **S. Balbach**, T. Kuborn, A. Schafer, C. Schwarz, R. Stowe

**2:45 402.** Our Model: High School Students’ Discourse When Collaboratively Generating Models to Explain Chemical Phenomena. **J. Timmer**

**3:05** Panel Discussion.

**3:25** Closing Remarks.

**3:30** Break.

**3:45** Introductory Remarks.

**3:50 403.** There’s More Than One Way to Model: Understanding the many ways students use particle-level representations to explain phenomena. **P. Waples**, A. Schafer, T. Kuborn, R. Stowe

**4:10 404.** Messaging Within The Classroom: When Student Groups Evolve Practices. **T.M. Kuborn**

**4:30** Panel Discussion.

**5:10** Closing Remarks.

WALC
1132

**Jim Spencer Memorial Symposium**
R. S. Moog, Organizer, Presiding

2:00 Introductory Remarks.


2:25 406. Collaborative Writing of POGIL Activities. **L. Trout**


3:05 408. Toward the vision of student-centered assessments in General Chemistry. **S. Garrett-Roe**

3:25 Closing Remarks.

3:30 Break.


4:30 411. Engaging students in physical chemistry. **R.S. Cole**


5:10 Closing Remarks.

PMU
North Ballroom
General Posters 2

M. T. van Opstal, Organizer, Presiding

5:30 - 6:30

413. Preparation of a dynamic, eight-coordinate, rhenium(V) polyhydride complex; a research-based advanced inorganic laboratory experiment. D.V. Naik, G.A. Moehring


415. Implementation of Recitations in General Chemistry I Laboratory Courses to Increase Student Performance. C. Lilly, A.B. Ormond, A.A. Carter, W.J. Powell


418. Access to Early Research Opportunities in Inorganic Chemistry. J.P. Lanorio

419. Adsorption isotherms, kinetic, and thermodynamic studies of magnetite-charcoal: linearized and non-linearized modeling of experimental data in general chemistry. R. Zablah-Vasquez, S. Simmons, A. Van Sertima, A. Villalta-Cerdas


421. Student Self-Efficacy Beliefs About NMR Problem-Solving. S. Kariyawasam Gamage, J. Cui, S. Mooring

422. Withdrawn

423. The pros and cons of using Jigsaw as a mode of cooperative learning for occupational therapy and biology undergraduate majors in a higher education laboratory setting. D.S. Derminio, J. Mirowsky
424. How Students' Perceptions of Faculty Mindset Influences their Motivation, Engagement, and Performance in Introductory Level Chemistry Courses. **R. Kattoum**


426. Determination of five physical constants in the General Chemistry laboratory. **S. Simmons**, L. Hendrickson, A. Villalta-Cerdas


428. Can You Master This?? Initial Attempts at Specifications-based Grading in Introductory Chemistry. **L. Kopff**

429. A Progression on Organic Chemistry Students’ Translation Between Reaction Mechanisms and Reaction Coordinate Diagrams about a Set of Acylation Reactions. **K. Barkho**, I. Zaimi, G.V. Szymczak Shultz


431. Instructors’ perceptions of the benefits and challenges of systems thinking in chemistry education. **S.E. York**, M. Orgill


433. Undergraduate students value drawing to learn biochemistry. **J. Mitchell**, M. Pennella

434. Chemistry olympiad during COVID pandemic - My experience as the coordinator for the Central MA section. **M. Krishnamurthy**

435. Specifications grading: Learning through mistakes. **T. Eaton**


439. Classroom Activities and Strategies for the Flipped Analytical Chemistry Course. **C. Edwards**


442. The use of perovskite nanocrystals across the chemistry curriculum. **R. Sanchez-Gonzalez**


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**TUESDAY**

WALC  
B066

**Beyond Classroom Observation**

J. Velasco, *Organizer, Presiding*

**8:00 Introductory Remarks.**

**8:05 473.** A qualitative study to capture classroom patterns/behaviors based on COPUS. **Y. Muten**, J. Harshman


9:05 476. An Overview of External Review. **R.C. Dudek**, K. Pate

9:25 Closing Remarks.

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WalC
3121

**Engaging Non-Majors in Introductory Chemistry Courses**

M. Mullen Davis, *Organizer, Presiding*

8:00 Introductory Remarks.

8:05 565. Superhero science. **S. Pierce**

8:25 566. Using the covid-19 phenomenon to improve students' connection to the nature of science. **G. Kerstiens**

8:45 567. Scientists who change the world. **K. Hess**, L. Burt-Nicolas

9:05 568. Increasing student engagement in a non-major introductory chemistry course by writing children's books. **M. Mullen Davis**

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.
11:05 569. Using themes to engage non-science majors in introductory chemistry: from nuclear and radiochemistry to scientific literacy and the science of superheroes. B. Shepler, C.L. Anfuso, R. Simmons


11:45 571. A well-balanced course: Incorporating collaborative learning and community service into a food chemistry course. H.V. Clontz

12:05 572. Development of an Online Chemistry and Sustainability Class for Non-Majors at UW - Green Bay. J.E. Kabrhel

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 573. Framing scientific literacy as a pathway to environmental justice. S. Brown

2:25 574. Creating authentic learning experiences in an online non-majors chemistry lab. U. Swamy

2:45 575. Building a brain: helping pre-service elementary teachers find their place in science education. K. Rust

3:05 576. Life is a candle: Connecting chemistry and philosophy in a cross-disciplinary learning community for undergraduate science majors. B.G. McBurnett, P. Lewis

3:25 Closing Remarks.

WALC
3090

Present and Future Directions in Organic Chemistry Laboratory Courses
C. S. Callam, N. M. Paul, Organizers, Presiding

8:00 Introduction.


8:25 610. How a Journal of Chemical Education article changed my perspective on Organic laboratory experiments 34 years ago, and what I’ve done in my labs since. B.A. Hathaway

8:45 611. Leveraging Undergraduate Learning Assistants for the Return to In-Person Labs. J. Griffin, P. Lopez, R.D. Link

9:05 Panel Discussion.

9:25 Closing Remarks.

9:30 Break.

11:00 Introduction.


11:45 614. Multiple short polymer experiments for the undergraduate organic chemistry laboratory. M.R. Korn, M.F. Scilley

12:05 Panel Discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introduction.

2:05 615. Evaluating reaction conditions for the Buchwald-Hartwig coupling. N.J. Hill


3:05 Panel Discussion.

3:25 Closing Remarks.

STEW 302

Active Learning in Organic Chemistry

A. Leontyev, Organizer
M. D. Casselman, V. M. Maloney, J. L. Muzyka, C. Welder, Presiding

8:00 Introductory Remarks.

8:05 445. Active Learning in Organic Chemistry: Let the adventure begin!. S.M. Strickland

8:25 446. Transparent Teaching in Organic Chemistry. M. Kelley


9:25 Closing Remarks.

9:30 Break.
11:00 Introductory Remarks.

11:05 449. Organic Chemistry Successes and Failures– Sustaining relevance, Teaching for equity, Useful resources. A. Steelman


12:05 452. Simulated Drug-Discovery Workshops: Development of a C/PBL activity that replicates the hit-to-lead optimization process in a classroom environment. R. Blackburn, S. Flower

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 453. Using Distractor Analysis and Backward Design to craft a new activity on Structural Isomerism. A.M. Pesce, D. King


2:45 455. It’s not just me! Using international partnerships to maintain active learning during the global pandemic. M.T. Wentzel, B. McCollum, L.A. Morsch, M. Gelata, H. Hussain


3:25 Closing Remarks.

3:30 Break.


3:50 457. Flipping a two-semester organic chemistry sequence to reduce DFW rates and support instruction during the pandemic. D.M. Schirch
4:10 458. Gathering resources and planning for a foolproof flipped classroom. L. Starkey

4:30 459. Use of iClicker for flipped organic chemistry courses for in-person, online, and HyFlex classes. J.M. Leslie


5:10 Closing Remarks.

WALC
2007

Biochemistry Education: Discussions of the lecture learning environment

R. Austin, T. A. Murray, Organizers, Presiding

8:00 Introductory Remarks.

8:05 477. Protein of the Year: Assessing skill-development in Biochemistry. K. Culhane

8:25 478. Building science identity one hemoglobin molecule at a time. C.J. Conway, K. Boyle

8:45 479. Engaging students in scientific literature review and structure visualization through the writing of molecular case studies. E. Pollock, K. Riley, D. Vardar-Ulu, S. Dutta

9:05 480. Fostering intellectual equity in an introductory biological chemistry course by engaging student-created activities. S. Testa

9:25 Closing Remarks.

9:30 Break.
11:00 Introductory Remarks.

11:05 481. Enacting team-based learning in upper-division biochemistry lecture courses: Key considerations and evidence of success. E. Offerdahl, J. Woodbury, J. Arneson

11:25 482. Integrating best practices into a Biochemistry course to create a student-centered classroom. K. Slade

11:45 483. Utilizing active learning strategies to enhance student understanding of foundational concepts in biochemistry. M. Kopecki-Fjetland

12:05 Panel Discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 484. Teaching carbohydrate metabolism in biochemistry using contemporary examples of synthetic and natural sweeteners. A.E. Shinnar

2:25 485. Integrating contextualization, scaffolding and active learning: A trifecta approach in enhancing health science students’ cognition and affect towards biochemistry. K. Fernandez, C. Thompson, N. Samarawickrema, T. Overton

2:45 486. Gamifying Biochemistry: Do games support student learning?. D. Emmert

3:05 Panel Discussion.

3:25 Closing Remarks.

3:30 Break.


3:50 487. Demonstrating biochemical mechanisms using student movement. M. Mullen Davis

Bobick, J. Contreras Vital, A. Erickson, C. Fondie, A. Lawrence, C. Morin, X. Prat-Resina

4:30 489. Incorporating “Molecular Case Studies” into large biochemistry courses. D. Vardar-Ulu, A. Lebov, E. Pollock, S. Dutta

4:50 Panel Discussion.

5:10 Closing Remarks.

STEW
311

Building Momentum for Systemic Change (#AdvancingEquityinCER)

S. M. Werner, Organizer
M. E. Howe, V. R. Ralph, C. Stachl, Presiding

8:00 Introductory Remarks.

8:05 490. A broader take on Trigwell and Prosser’s conceptions of teaching and learning: relating instructors’ thoughts on diversity in higher education to their conceptions of teaching and learning. A. Heidbrink, N. Suarez, S.M. Lo

8:25 491. A seminar series that enhances a chemistry degree by supporting students and developing their soft skills. M.A. Vanalstine-Parris

8:45 492. An Interdisciplinary Peer-Mentoring Program to Promote Inclusive Teaching Practices at a Small Liberal Arts College. J. Fishovitz, M. Schaeffer, J. Cobintz, S. Mancino, R. Rohatgi

9:05 493. Elements of equity and opportunities for equitable reform in chemistry instruction. A. Margiotta, C.E. Brown

9:25 Closing Remarks.

9:30 Break.
11:00 Introductory Remarks.

11:05 494. Examining the STEM institution from the perspective of parenting women in STEM doctoral programs: An Institutional Ethnography. C.E. Wright

11:25 495. Graduate Student Women’s Perceptions of Faculty Careers in Chemistry. M.E. Howe, M.M. Kim, S. Pazicni

11:45 496. STEM Career Perceptions of Black/African American, Latina/o/x, and Puerto Rican Graduate Students. J.M. Ribble

12:05 Panel Discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 497. For whom do we design? Considering culture, reflexivity, and partnership within the design process. J.L. Spencer, D.N. Maxwell, G.V. Szymczak Shultz

2:25 498. Caught between two worlds: Graduate school for Black and Latinx STEM students at PWIs. M.G. Grunert Kowalske

2:45 499. Navigating within the Borderlands: Experiences of Historically Marginalized Graduate Students within a Chemistry Doctoral Program. J.E. Nardo

3:05 500. Professional, Inclusive, Engaged, and Research-Based Reforms in Science, Technology, Engineering, and Mathematics. V.R. Ralph

3:25 Closing Remarks.

3:30 Break.


4:10 502. Making invisible work visible and valued: creating a model to measure and report the impact of invisible work in academia. S. Jilani


5:10 Closing Remarks.

WALC B058

Chemistry Education Research: Graduate Student Research Symposium

M. Connor, O. Crandell, Organizers, Presiding

8:00 Introductory Remarks.

8:05 505. Characterizing Chemistry Students’ Domain-General Symmetry Knowledge. A. Sangha, S. Pazicni

8:25 506. Qualitative investigation of student attention to molecular structure features when prompted to consider symmetry. R. Morgenstern, S. Pazicni

8:45 507. Unprompted Student Gestures in a Model-Based Inorganic Symmetry Activity. J.J. Markut, D.J. Wink

9:05 508. Emphasizing the role of coordination class theory on the study of student learning with representations. S. Spurgeon, M. Stieff

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.
11:05 509. Presenting a Progression on Organic Chemistry Students’ Translation between Reaction Mechanisms and Reaction Coordinate Diagrams. I. Zaimi, K. Barkho, G.V. Szymczak Shultz

11:25 510. General Chemistry Students’ Data Analysis and Interpretation of Graphical Data. S. Berg, A.C. Moon

11:45 511. Understanding how changing molecular representations impact students’ process of predicting the location of strongest intermolecular forces. A. Farheen, H.T. Nguyen, S.E. Lewis


12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.


2:45 515. Exploring achievement emotions of general chemistry students. A. Graves, C.E. Brown

3:05 516. Student Experience in the UIC STEM Initiative CoLab Program. A. Wierzechowski

3:25 Closing Remarks.

3:30 Break.


A literature review of studies analyzing chemistry textbooks. **Z.L. Bunch**, B. Thompson, M. Popova

**Development of Rubrics for Evaluating Students' Data Analysis and Interpretation.** **M.T. Urbanek**, B. Couch, L. Prevost, A.C. Moon

**Student expectations, buy-in, and engagement in lower division undergraduate chemistry labs.** **E.B. Vaughan**, J. Barbera

Closing Remarks.

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**Computational Chemistry in the Classroom**

J. B. Dudek, A. N. Migues, *Organizers, Presiding*

**Introductory Remarks.**

**Overcoming the barriers to using computational chemistry in your classroom.** **K.R. Gallagher**

**Exploring electron configurations of atoms and ions with WebMO and Gaussian.** **K. Range**

**Computational chemistry as part of the first-year undergraduate curriculum.** **J.B. Foresman**, K. Howard

**Introducing computational chemistry to General Chemistry freshmen vs. Physical Chemistry seniors.** **D.V. Chulhai**

Closing Remarks.

Break.

**Introductory Remarks.**
11:05 525. Computational Exercises in Physical Chemistry: From Gaussian to the WebMO Mobile App. S.M. Basu


11:45 527. Computational Chemistry Calculations of the Molecular Charge Distribution and Dipole Moments of Solvatofluorochromic Dyes for the Physical Chemistry Curriculum. B. Findley, R. Pawlaczyk

12:05 528. Withdrawn

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 529. Introducing the dihedral angle of H2O2 through computational chemistry. C. Salter

2:25 530. Using computational chemistry to peer through the window at molecules responsible for the greenhouse effect. L. Tribe, K.R. Gallagher

2:45 531. Creating your own chemistry simulations is easier than you think. W.J. Vining

3:05 532. Using the Compute-to-Learn Pedagogy in Physical and General Chemistry Courses. H.P. Hendrickson

3:25 Closing Remarks.

3:30 Break.


3:50 533. Visualizing potential energy surfaces to deepen chemical understanding. J.L. Sonnenberg

4:10 534. Computational Chemistry in the Inorganic Classroom: Using WebMO and Gaussian to Teach Group Theory. A.C. Davis, J.M. Smith

4:50 Panel Discussion.

5:10 Closing Remarks.

WALC
2051

**Culturally Relevant and Inclusive Chemistry Curriculum and Pedagogies**

J. L. Muzyka, *Organizer, Presiding*
S. Sanders, L. Winfield, *Presiding*

8:00 Introductory Remarks.

8:05 536. Fostering Diversity and Inclusion and Understanding Implicit Bias in Undergraduate Chemical Education. **A. Nakamura**

8:25 537. Inclusive course design to support student success in organic chemistry: Development, implementation, and evaluation of resources and assessments. **D.A. Turner**

8:45 538. Tips on increasing the diversity, equity, and inclusivity of your chemistry classroom and curriculum. **M. Livezey**

9:05 539. Practical applications of Universal Design for Learning (UDL) in First-year Chemistry. **D.G. Mitchell**

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:25 541. Teacher ethnicity: reflections on awareness and representation. **M. Navarro-Camacho**

11:45 542. Creating space for culture in the science classroom: Power dynamic patterns during a classroom-based, culturally relevant research project. **K. Hosbein**, J. Spencer, D.N. Maxwell, G.V. Szymczak Shultz

12:05 Panel Discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 543. Sign Language Incorporation in Chemistry Education (SLICE): How efforts made to include a few have rippling effects for many. **T. Goudreau Collison**, J. Swartzenberg, A. Sheikh, K. Clark, A. Gleason, C. Cummings, J. Dominguez, M. Mailhot

2:25 544. Challenges and Removing Barriers in the Undergraduate Chemistry Curriculum for Blind and Low Vision Students. **A.T. DAgostino**


3:25 Closing Remarks.

3:30 Break.


3:50 547. Curating Connections between the Chemistry Curriculum and Student’s Lives. **S. Sanders**

4:10 548. Linking chemistry to the community: Integration of culturally-responsive teaching into general chemistry I laboratory. **A.J. Winstead**
4:30 549. Using environmental chemistry to engage students in scientific thinking while affirming their cultural context. **J.L. Spencer**, D.N. Maxwell, L. Nicholas-Figueroa, K.A. Pratt, G.V. Szymczak Shultz

4:50 550. Incorporating inclusive teaching practices in the design of a course-based undergraduate research experience in polymer chemistry. **A. Abdulahad**

5:10 Closing Remarks.

**Disrupting Grading**

R. D. Link, *Organizer, Presiding*

8:00 Introductory Remarks.

8:05 551. Specifications Grading in Organic Chemistry. **J.L. Muzyka**

8:25 552. How To Earn Your Specs Grading Retakes (So That You Won’t Need Them). **J.R. Ring**

8:45 553. And the points don't matter: Specifications grading in a summer accelerated organic lecture course. **R.D. Link**

9:05 Panel Discussion.

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:25 555. A grading system for organic chemistry to focus student learning and reduce student stress. **F.M. Rossi**


12:05 557. Adaptive grading: Using a simple R script to more fairly and equitably assign grades in organic chemistry. **S.M. King**

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 558. An Integrated Approach to Grading Using Peer Learning Assistants to Facilitate Mastery of Course Outcomes. **D.A. Barr**

2:25 559. A flipped classroom with (almost) mastering learning, learning outcomes assessments, and equity grading. **J. Collins**

2:45 560. Specifications Grading and Practical Examination in Organic Chemistry I Lab at Trine University. **D.A. Quist, S.B. Dulaney**

3:05 561. How Student Buy-In to Specifications Grading Changes Throughout a Term. **W.J. Howitz**

3:25 Closing Remarks.

3:30 Break.


3:50 562. Leaving exams behind: Presentations as assessment. **S.S. Hunnicutt**


4:30 564. Group and Speed-Dating Models for Cooperative Formative Exams. **P. Smith, R. Clark**

4:50 Panel Discussion.

5:10 Closing Remarks.
General Chemistry Lab: Curriculum and Best Practices

J. Maeyer, Organizer, Presiding

8:00 Introductory Remarks.

8:05 593. Design, Management, and Implementation Strategies in General Chemistry Labs. C. Rezsnyak


9:05 596. Designing new undergraduate teaching labs at Arizona State University (ASU) to support pedagogical improvements in general chemistry instruction. B. Smith, R. Briggs, S. Sendler

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 597. Best practices for teaching general chemistry lab at a diverse, minority serving institution. m. khural

11:45 599. What Comes Next: Increasing Use of Instrumentation and Recurring Chemical Systems of Study to Serve Students Staying in STEM. S. Block, P. Doolittle, B.J. Esselman, E. Garand, L. Gustin, S. Pazicni

12:05 600. Teaching thermochemistry through experiments and demonstrations. A.E. Shinnar, M. Weitz, R. Bienenstock

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 601. The Use of a Lab Practical as a Formative and Summative Assessment. E. Marlier

2:25 602. General chemistry lab practicals at Augusta University. S.A. Myers, A.C. Spencer, C. Eidell

2:45 603. Microsoft Excel in the General Chemistry Laboratory. K. McElhoney

3:05 604. Eliminating reports in general chemistry lab: Using small assignments to teach and assess understanding. J. Maeyer

3:25 Closing Remarks.

3:30 Break.


4:30 607. So what if my lab looks like a stock photo for chemistry: Food dyes and HPLC in the general chemistry laboratory. G.R. Wyllie, S. Palme, A.H. Johnson

4:50 608. A Libretexts based electronic lab manual involving IOT enhanced experiments connected to Google workbooks. L. Poirot, E. Lisitsyna, R.E. Belford
5:10 Closing Remarks.

BRWN
3102

An Early CURE: Course Based Undergraduate Research Experiences in General Chemistry.

G. R. Wyllie, Organizer, Presiding

8:00 Introductory Remarks.

8:05 461. What’s in your water? A CURE for general chemistry students. D. Behmke

8:25 462. Brewing up engagement in the General Chemistry laboratory: a semester-long pre-CURE course focused on the chemistry of beer. D.E. Blumling, C.A. Hughey, B. Boardman, O.H. Judd

8:45 463. A scaffolded gold nanoparticle CURE in a general chemistry laboratory. K.L. Stone


9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 465. Remediation of metal ions using modified cellulose - A first semester general chemistry CURE project. J.A. Conrad, S. Kerkman

11:25 466. Creating a connected CURE - linking student research teams in general chemistry across space and time. G.R. Wyllie

11:45 Panel Discussion.
12:25 Closing Remarks.

WALC
1055

Assessment and Measurement in Research and Practice

K. L. Murphy, J. R. Raker, Organizers, Presiding

8:00 Introductory Remarks.

8:05 467. How does an early math review impact a student’s arithmetic skills and performance in first-semester general chemistry? T.E. Alivio, E. Howard, B. Mamiya, V.M. Williamson

8:25 468. Item analysis of Math up Skills Test (MUST) questions after an early math review in a first-semester general chemistry class. T.E. Alivio, C.E. Galloway, B. Mamiya, V.M. Williamson

8:45 469. Math skills, GPA, and first exam scores: Predictors of success in first-semester Organic Chemistry. K. Lee, B. Rix

9:05 Panel Discussion.

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 470. Using a web-based STEM assessment platform in a controlled environment to administer General Chemistry examinations efficiently and securely for a large, multi-sectional class. J.C. Rienstra-Kiracofe, D. Steffen, B. Carmichael, M. Miller, C. Wright, W. Grauvogel, A. Poore, N. Pizzala

11:25 471. Construction and Assessment of Cumulative Final Exams in General Chemistry. C. Rezsnyak
The Impact Online, Standards-based Homework Assignments have on Student Homework Completion and Academic Self-Reflection in a High School Science Classroom. **C. Evans**

**12:05** Panel Discussion.

**12:25** Closing Remarks.

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**Evidence-based Instructional Practices: Claims, evidence, reasoning (CER) and Argument-driven inquiry**

K. E. Carrigan, A. Modic, M. Orgill, S. Pazicni, **Organizers**  
J. P. Walker, **Presiding**

**8:00** Introductory Remarks.

**8:05 577.** The Argument-Driven Inquiry instructional model: A brief overview, its origin, and some ways it has been refined over time. **V. Sampson**

**8:25 578.** Research on student learning during Argument-Driven Inquiry: Some findings from studies conducted in middle and high school classrooms. **V. Sampson**

**8:45 579.** Laboratory Learning and Research: 10-years of research on Argument-driven inquiry in post-secondary education. **J.P. Walker**

**9:05 580.** The transformation of introductory science laboratories from traditional to Argument-Driven Inquiry at East Carolina University: Avoiding barriers for successful large-scale change. **K. Hosbein**

**9:25** Closing Remarks.

**9:30** Break.

**11:00** Introductory Remarks.
11:05 581. Hybrid ADI-SWH Labs: Bringing together the best of both worlds. **D.I. Del Carlo**

11:25 582. Loose in the Lab? Inquiry Implementation in the High School Classroom. **A. Modic**

11:45 583. Argument Driven Inquiry with a theme and specifications grading in general chemistry laboratory. **K.D. Edwards**

12:05 584. Implementing argumentation sessions in an upper division laboratory course. **M.N. van Staveren, L. Kesner**

12:25 Closing Remarks.

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**Gateways to success: Initiatives and programs to support STEM diversity**

V. L. Miller, C. P. Schick, P. M. Takahara, *Organizers*
L. J. Anna, *Organizer, Presiding*

8:00 Opening Remarks.

8:05 585. NASA Day Events Promote Science in the Community. **C. White**

8:25 586. Teaching Chemistry to Underrepresented Middle School Students in an Informal STEM Program. **M. McCollan**

8:45 587. Design of a STEM Workshop Focused on Natural Products for Middle School and High School Students. **H. Albright**


9:25 Closing Remarks.
9:30 Break.

11:00 Opening Remarks.

11:05 589. Exploring alternative preparation and co-requisite support course models to open the gate to general chemistry. **L.J. Anna**, V.L. Miller


12:05 592. Withdrawn

12:25 Closing Remarks.

BRWN 3100

**Project Orientated Undergraduate Lab Design**

A. L. Courtney, R. Loy, *Organizers, Presiding*

8:00 Introductory Remarks.

8:05 618. Towards Course Based Undergraduate Research in Advanced General Chemistry Laboratory. **J. Nelson**, B. Abrams

8:25 619. Project-oriented lab design to integrate drug discovery research methods into the organic chemistry laboratory. **A.L. Courtney**, K. Bushell

8:45 620. Organic Chemistry Laboratory Capstone Projects. **R. Loy**

9:05 Panel Discussion.
9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 621. A two-stage project orientated redesign of an introductory biochemistry laboratory. **D. Vardar-Ulu**

11:25 622. High Point University Advanced Topics Laboratories: Interdisciplinary Lab Courses Designed to Engage Students with Cutting-Edge Topics and Laboratory Experiences. **B. Augustine**, M.S. Blackledge, P.M. Lundin, K.H. Fogarty


12:05 Panel Discussion.

12:25 Closing Remarks.

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**Using Eye-tracking technology as a magnifying glass to investigate learners cognition**

N. Graulich, *Organizer, Presiding*

8:00 Introductory Remarks.

8:05 624. Investigating undergraduate organic chemistry students’ use of cognitive resources during stereochemical tasks through eye tracking. **A. Corrales**, A.S. Allen, M. Atkinson
8:25 625. "I've derived them logically": Exploring students’ drawing processes of resonance structures in organic chemistry via eye-tracking. I. Braun, A. Langner, N. Graulich

8:45 626. Modifying Particulate-level Animations Using Eye-tracking Technology. S. Akaygun, J.R. Vandenplas

9:05 Panel Discussion.

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 627. Using eye-tracking to investigate the task dependency of visual attention during cognitive tasks in organic chemistry. K.L. Havanki

11:25 628. How have I solved the problem? An eye-gaze augmented retrospective to foster students’ comprehension of organic chemical representations. A. Langner, N. Graulich

11:45 Panel Discussion.

12:25 Closing Remarks.

PMU
North Ballroom

General Posters 3

M. T. van Opstal, Organizer, Presiding

9:30 - 10:30

629. Agar Art as an Instructional Tool to Teach Inducible Promoters via Fluorescence Protein Expression. L. Jefferies, A.N. Giordano
Computation exercises for undergraduate students to learn about molecular geometry, and formal charges (Freshmen and Sophomore level) as well as Temperature Dependence of Heat Capacity (Junior and Senior) levels. **F.M. Chen**

**631. Lessons Learned: Constructing new Chemistry Program Learning Outcomes.**
**R.M. Kelly**, P. Dirlam, M.R. Radlauer

It takes a village to embed interprofessional skills into the chemistry curriculum.** A.E. Kondo**, J. Fair, M. Benjamin, K. Bohl, R. DeSoto Jackson, M. Hildebrandt, R. Major, H. Molina

**633. Barriers to Incorporating More Chemistry Content by Elementary School Teachers.** **A. Alveshere**, R. Waterman


Investigating English Language Learners Engagement and Challenges in a Process Oriented Guided Inquiry Learning (POGIL) Based General Chemistry Class. **S. Zakher**

It's a Square, Nautical Analogy, and the Equilibrium AttraKor: Innovative Tactics to Approach Some Common General Chemistry Topics. **J.F. Lomax**

Development of a multistep synthesis of imrecoxib, rofecoxib and zolimidine as a versatile capstone project for the organic chemistry laboratory. **J.I. Juncosa**, L. Black, W. Turner, T. Martin

Impacts of intentional journaling on high school science learners. **C. Evans**

Using a cumulative review problem in general chemistry. **M.D. Fritz**


Beyond the drawn structures: Investigating students’ reasoning with own resonance drawings in organic case comparison tasks. **I. Braun**, N. Graulich

Reinforcing linguistic accessibility in chemistry: Developing more equitable assessment items. **A. Stephens, A. Pares Alicea**, E. Lee
643. An at-home enzymes kinetics simulation using yeast fermentation. S. Gilpatrick, S. Dew

644. Leveraging journal article use in gen chem lab assignments to improve students’ study skills. D. Fisher


646. Integration of evidence-based learning strategies in chemistry bridge courses at Sam Houston State University. A. Villalta-Cerdas, S.L. Hegwood, D.E. Thompson

647. Do students think employer-desired competencies can be developed in online general chemistry labs?. B. Eggly, P. Patterson-Lee, L.A. Posey

648. Connections between intermolecular forces and chemical separation/adsorption/purification: An example of teaching forces in liquids and solids by systems thinking. C. Wang

649. Impacts of the 2021 and 2022 Active Learning in Organic Chemistry Workshops. S.E. Ruhe, J. Houseknecht


651. Learning the chemistry of ceramics and pottery via a field trip. V. Gupta, S. Kumar, M. Nigam

652. Reducing researcher bias: Participant-driven visual representation in qualitative education research. E.A. Boyd, K.B. Lazar, M. Voigt


654. Creating a Forensic Chemistry Capstone for General Chemistry students. S. Parrott

655. Investigating supports and barriers in chemistry classroom materials for English Language Learners (ELLs) at a Hispanic Serving Institution. D.R. Martinez Rioseco, J.H. Carmel
656. Toward the quantification of serotonin in crayfish hemolymph by gas chromatography - mass spectrometry (GC-MS). E. Lovins, L.H. Mielke

657. Engaging Teens in Career Exploration and STEM Leadership through Formal/Informal Education Partnerships. B. Oatman

658. Scaffolding a Successful Chemistry Lab Curriculum. A. Altemose, E. Lee, A.C. Songok


660. Utilizing student attitude in introductory STEM courses: A closer look into General Chemistry I student feedback. C.D. Glenn, P.M. Clevenger, D.S. Williams


STEW 206

A Contextualized Approach to Teaching Chemistry

B. D. Fahlman, Organizer, Presiding

11:00 Introductory Remarks.

11:05 662. Design of interactive videos for a context-first chemistry course. B.D. Fahlman

11:25 663. Perusall: A social reading annotation platform that connects students in contexts that matter. J.M. Buth

11:45 664. Inspiring students with sustainable invention. J. Butler, K. Anderson

12:05 665. Assessing students’ critical thinking skills with a molecular design project. S. Sun
12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 666. Real-world related assignments in lower and upper division chemistry classes. F. Hou

2:25 667. Sprinkling short modules on current research and emerging topics throughout an undergraduate biochemistry course to engage student interest. L.A. Rowe


3:05 Panel Discussion.

3:25 Closing Remarks.

3:30 Break.


3:50 669. Molecular beauty: The chemistry in cosmetic products. A novel course for undergraduates highlighting the applicability of chemistry topics and principles in a ubiquitous product, namely cosmetics. S. Thyagarajan

4:10 670. Teaching in context: Analyzing food in the instrumental analysis laboratory. D.A. Belle-Oudry

4:30 671. From vine to bottle: Lessons learned working in a wine lab during the 2020 harvest in Oregon. B.E. Taylor

4:50 672. Engaging students in chemistry through literary metaphor. K. Hoffman

5:10 Closing Remarks.

WALC
B066
Advances in e-Learning, Digital Learning, and Online Chemical Education

D. A. Canelas, Organizer, Presiding

11:00 Introductory Remarks.

11:05 673. Moving Whiteboarding Online: Attempting Interactive Learning in Online Discussion Boards. B.E. Jenkins

11:25 674. Use of an online social annotation platform to facilitate asynchronous, collaborative learning in a flipped organic chemistry course. A. Sigmon

11:45 675. Building Community in an Online Course. J. Selco

12:05 676. Student writing in massive open online chemistry classes. D.A. Canelas

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 677. Meeting the Need of Diverse Learners: New Technology that Remediates Math Skills & Chemistry Struggle Points with Spaced Practice. J.B. Weinberg


2:45 679. How do students in a large general education Chemistry course use their personal technology for their academic work?. T. Porter, L. Zhu, R. Elliott

3:05 680. Why Students Withdraw from Online General Chemistry. E. Faulconer

3:25 Closing Remarks.

3:30 Break.

3:50 681. Using Socrative Online Polls for Active Learning in the Remote or Hybrid Classroom. **A.M. Christianson**


4:30 683. Free multi-media learning objects that help students learn chemistry content. **J. Selco**


5:10 Closing Remarks.

WALC 1132

**In Memoriam: Celebrating the Life and Works of George M. Bodner**

G. Bhattacharyya, A. C. Davis, **Organizers, Presiding**

11:00 Introductory Remarks.

11:05 685. The relevance of George Bodner’s to the work of modern practitioners. **K. Casey, S. Holladay**

11:25 686. In the Beginning was Problem Solving, Spatial Ability and a Motorcycle. **J.R. Pribyl**

11:45 687. Let's make learning more challenging: The influence of desirable difficulties on general chemistry students' problem-solving performance. **O. Gulacar, B. Vernoy, A. Wu**

12:05 Audience Remembrance.

12:25 Closing Remarks.
12:30 Lunch.

2:00 Introductory Remarks.

2:05 688. Lessons from George Bodner: “Framing” quality chemistry education research. **M. Orgill**


2:45 690. Gadamer's Hermeneutics and Narrative Analysis: Complementary Theoretical Frameworks. **J.W. Shane**

3:05 Audience Remembrance.

3:25 Closing Remarks.

3:30 Break.


3:50 691. Revisiting the problem-solving mindset. **D.E. Gardner**

4:10 692. Toward an educational theory of "Organic Chemistry as a Second Language.". **R. Ferguson**, D.P. Cartrette

4:30 693. What does research on electron pushing tell us about students’ sense-making and the continued viability of the mechanistic approach to teaching organic chemistry?. **G. Bhattacharyya**

4:50 Audience Remembrance.

5:10 Closing Remarks.

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**STEW 313**

**Innovations in instruction in large-enrollment lecture courses**
11:00 Introductory Remarks.


11:25 695. The impact of Supplemental Instruction on teaching students how to learn. C. Reck, K. Arnold


12:05 697. Headstart Classes for Early Intervention: A Strategy to Promote Retention in Large Introductory Chemistry Courses. D. Snaddon

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 698. An empirical investigation of the relationships among conceptions of teaching, instructional practices, and student outcomes. Q. Cui, S. Swarat, D. Drane, R. Baiduc, G.J. Light, S.M. Lo

2:25 699. The Effect of Flipped Learning and Multiple Assessment Opportunities on Achievement in a Large General Chemistry Course. M.R. Porter, J.K. Robinson, E. McKenzie


3:25 Closing Remarks.
3:30 Break.


3:50 702. Using clickers for peer instruction in weekly discussion sessions of a large-enrollment course of organic chemistry. D. Cruz-Ramirez de Arellano

4:10 703. Course Modifications to Increase Student Success in Organic Chemistry 2. L.C. Brown

4:30 704. Data-informed Messaging: Guiding Student Engagement and Increasing Metacognition in Large Enrollment Courses. A. Brummett, J. Russell


5:10 Closing Remarks.

STEW
202

Preparing students for success in organic chemistry

J. M. Fautch, J. Houck, Organizers, Presiding

11:00 Introductory Remarks.

11:05 706. OrgoPrep: improving student outcomes in organic chemistry through a peer-led remote intersession program. B. Abrams


12:05 709. Development and Implementation of a 2-Week Course to Prepare Students for Organic Chemistry. **K. Stewart**

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 710. Using digital tools to engage students in prerequisite review for organic chemistry. **J. Houck**

2:25 711. Participating in a high-structure general chemistry course found to increase student retention to organic chemistry. **J. Casey**, K. Supriya, S. Shaked, J. Caram, A. Courey


3:05 713. Eliciting mechanistic reasoning underpinning syntheses with intentional prompt design. **A. Ellison**, B.J. Esselman, R. Stowe

3:25 Closing Remarks.

3:30 Break.


3:50 714. How to design tutorial videos in organic chemistry and what do students truly learn from them?. **J. Eckhard**, M. Rodemer, S. Bernholt, N. Graulich

4:10 715. "Small Bites" - Selected general chemistry topic reviews relevant to organic chemistry. **G. Castillo Valdes**, S.A. Dandekar

4:30 716. Prelecture Videos for Organic Chemistry Lecture. **R. Loy**


5:10 Closing Remarks.
Assessment Instruments: Design, Development, and Evaluation

M. Atkinson, J. Barbera, Organizers, Presiding

2:00 Introductory Remarks.


2:25 719. The Development of Ordered Multiple-Choice Items for measuring Students’ understanding of Light and Light Matter Interaction. H. Alfulaiti, M. Balabanoff, A.C. Moon

2:45 720. Measuring Understanding with the Reaction Coordinate Diagram Inventory (RCDI). M. Atkinson, S. Bretz


3:25 Closing Remarks.

3:30 Break.


4:10 723. Utilizing Differential Item Functioning to Further Validate the Fundamental Concepts for Organic Reaction Mechanisms Inventory. S. Nedungadi, C.E. Brown

4:30 724. Establishing the validity and reliability of the organic chemistry representational competence assessment (ORCA). L. Wright Ward, F. Rotich, J. Hoang, J.R. Raker, M. Popova

4:50 Panel Discussion.
5:10 Closing Remarks.

Big 10 Gen Chem Labs: Advances, Innovations, and Challenges

E. G. Malina, Organizer, Presiding

2:00 Introductory Remarks.


2:25 726. General chemistry labs during a pandemic: Hands-on laboratory work at home. M.D. Driessen

2:45 727. Returning to the labs after remote instruction; lessons learned in General Chemistry Labs at Penn State. A.M. Bischof, L. Funari, A. Herring

3:05 728. What COVID-19 “brought to the table” in our general chemistry laboratory curriculum. B. Opoku-Agyeman, A. Moore, T. Weaver, A. Welch, M. Nolan, T. Hanks

3:25 Closing Remarks.

3:30 Break.


3:50 729. Why do we teach lab: How remote instruction motivated lasting change in General Chemistry lab assessments. K.A. Gesmundo, V.M. Berns

4:10 730. Implementing Introductory Project-Based Labs: Developments & Drawbacks. B. Busby, J.L. Herman
4:30 Panel Discussion.

5:10 Closing Remarks.

Evolution of the ACS Guidelines for Approved Programs & the Future of Chemical Education

M. Brooks, Organizer
S. Reid, Presiding

2:00 Introductory Remarks.

2:05 731. Evolution of the ACS Guidelines for Approved Programs: 2022 Preview. S.A. Reid


2:45 733. Exploring the Value of ACS Approval for Baccalaureate Programs. C.E. MacBeth

3:05 734. A Data “Snapshot” of ACS Approved Institutions. M. Brooks, F.A. Fullilove-Cashwell, N. Jenkins, S.A. Reid

3:25 Closing Remarks.

3:30 Break.


3:50 735. Rethinking the Laboratory Requirements in the ACS Guidelines: Best measures for assessing the laboratory experience. K. Frederick, E.A. Arriaga

4:30 737. Human and Animal Pharma Perspective on Required Lab Skills in Discovery and Development Labs. B.M. Mathes


5:10 Closing Remarks.

BRWN
3100

Reimagining Chemistry Education: Integrating Systems Thinking into Green & Sustainable Chemistry Education

N. J. O'Neil, Organizer
G. Hurst, J. E. Wissinger, Organizers, Presiding

2:00 Introductory Remarks.

2:05 739. Investigating student reasoning in green and sustainable chemistry through the design-based research of decision memos. S. Petritis, H. Mcfall-Boegeman, M. Zhang, E.L. Day, M. Cooper

2:25 740. Development and implementation of an organic chemistry module on nucleophilic substitution reactions emphasizing solvent selection through a sustainability and systems thinking approach. S.A. Cummings, T. Fernando

2:45 741. Implementing systems thinking and the UNSDGs into the organic chemistry curriculum: Teaching NMR spectroscopy and MS spectrometry as powerful tools to Introduce students to global issues. K.M. Halligan, I. Larraza

3:05 742. Choose your own green chemistry synthesis adventure: A general chemistry laboratory experience. A. Thomas, C.R. Pulliam, E.E. Liu
3:25 Closing Remarks.

3:30 Break.


4:10 744. Life imitates art: Encouraging systems thinking in chemistry through a curriculum inspired by Wagnerian opera. D.A. Laviska

4:30 Panel Discussion.

5:10 Closing Remarks.

BRWN
3102

The affective domain in chemistry education: Impact of affective and cognitive factors on student learning and pedagogical practices.

S. Srinivasan, S. Villafane-Garcia, Organizers
M. Anzovino, Presiding

2:00 Introductory Remarks.

2:05 745. Student Goals and the Contexts of a Flipped-Learning General Chemistry II Course. E. Roth, C. Randles, R. Tasker

2:25 746. GPS guidance for building community and motivating students. L. Starkey

2:45 747. Withdrawn

3:05 Panel Discussion.

3:25 Closing Remarks.
3:30 Break.


3:50 748. Relationship between Course-Level Social Belonging (Sense of Belonging and Belonging Uncertainty) and Academic Performance in General Chemistry 1. **J. Edwards**, R. Barthelemy, R. Frey

4:10 749. Learning outside the textbook: Pedagogical practices that impact the affective domain in general chemistry classes. **L.D. Montes, C.B. Frech**


4:50 Panel Discussion.

5:10 Closing Remarks.

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BRWN
3104

**Think, Plan, Teach: Enacted Pedagogical Content Knowledge in Higher Education**

E. L. Atieh, L. Shi, *Organizers, Presiding*

2:00 Introductory Remarks.


2:25 752. Why we do what we do: Factors that influence STEM faculty members' instructional decisions. **R. Sansom**
2:45 753. Pedagogical Chemistry Sensemaking: A conceptual framework to promote pedagogical sensemaking in model-based lesson planning. **M.M. Wu, E.J. Yezierski**

3:05 Panel Discussion.

3:25 Closing Remarks.

3:30 Break.


4:10 755. Case study characterizing organic chemistry instructors’ Pedagogical Content Knowledge around teaching with representations. **T. Jones, J.M. Pratt, M. Popova**

4:30 756. Impact of Covid-19 Pandemic on Introductory STEM Instructors ePCK. **S.B. Boesdorfer**

4:50 Panel Discussion.

5:10 Closing Remarks.

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WALC
3090

**Chemistry education research: Undergraduate student research symposium**

J. Donnelly, N. Lapeyrouse, **Organizers, Presiding**


4:30 759. Integrating the teaching of biomimicry through Nanoeducation and its impact on attitudes and argumentation among high school students - the case of gecko behavior and nano liposomes as drug carriers. **M. Hugerat**, S. Elgamal, S. Asli

4:50 760. Applications of the MAtCH Model to Analyze Student Problem-Solving. **B. Chiu**, C. Randles, S.M. Irby

5:10 Concluding Remarks.

PMU
North Ballroom

**General Posters 4**

M. T. van Opstal, *Organizer, Presiding*

**5:30 - 6:30**


762. Teaching Chemistry Using the of the Apollo 11 Lunar Landing from Popular Media. **J.G. Goll**, E. Romanin

763. Investigating the Effects of Instructor Facilitation on Student Engagement in a POGIL Based General Chemistry Class. **K. Abouelyamin**, G. Rushton, J. Reid, S. Fateh

764. Investigations Into Aryne Reactivity through Summer and Course-Based Undergraduate Research. **J.K. Kisunzu**

765. Analysis of the elements of journalism and constructively responsive reading in promoting reading comprehension and analytical writing when learning industrial and environmental chemistry. **S.R. Esjornson**

767. Breaking the language barrier in chemistry assessment: Project plan and outcomes. A.E. Kim, E. Lee

768. Fun and Games with InteractiveChemistry.org. S.G. Sogo


770. Gamifying inorganic chemistry in a small college (and virtual) classroom setting. J. Wolfgram, B. Wile

771. Pandemic silver linings: Online lab materials development and subsequent use to improve face-to-face general chemistry labs. D. Fisher, J.M. Denton, M.D. Fritz

772. ACS Project SEED During the Pandemic: Improvements and Learning Outcomes in Providing Professional Development and College Readiness to Promising High School Students. E. Speidell, C. Kuniyoshi, N. Bakowski

773. Developing Writing Techniques in a First-Year General Chemistry Laboratory. G. Pealer, C. Johnson

774. Extraction and Isolation of Sulfur Phases in Meteorite Simulants. R.W. Hilts


777. A Socially-Collaborative Model-Based Symmetry Activity for Inorganic Chemistry. J.J. Markut, D.J. Wink

778. The Exploration of Integrating a Community Service Learning Water Project into a Postsecondary Analytical Chemistry II Lab. K. Ho, S. Smith, C. Venter

Addressing learning gaps in acid-base chemistry using novel three-dimensional models. **G. Grimes, A. Blecking, M. Hoelzer**

Examining the Impact of an Online Pre-Course and Values Affirmation Activity in a First-Semester Organic Chemistry Course on Course Outcomes. **T.L. Vickrey, G. Grinde**

How do you see carbs? Undergraduate Students’ Interpretation of Carbohydrate Projections. **J. Garcia, M.H. Towns**

Assessing Learning in the Laboratory for a General Chemistry Course-Based Undergraduate Research Experience. **A. Potts, K.A. Grice, T.A. French**

Aggies Versus The Pandemic. **A. Altemose, E. Lee, A.C. Songok**

Design for Online Collaborations – Beyond the Pandemic. **L.A. Morsch, B. McCollum, M.T. Wentzel**

DIY in General Chemistry Lab. **K.E. Anderson, S.R. Livingston**

The Internet of Chemistry Things (IoCT). **L. Poirot, E. Lisitsyna, H. Tiner, E. Bouzid, E.C. Bucholtz, R.E. Belford**


Forensic analysis of go kart racing tire preparation solutions. **I. Johnson, L.H. Mielke**

Strategies for Encouraging More Chemistry and Biochemistry Students to Take Math Beyond the Two Semesters of Calculus Required. **B. Findley, M.J. Andrea, D.R. Wawruck, G. Ashline**

Evolution of the Organic Laboratory Program at Hope College as a Result of the COVID-19 Pandemic. **T. Smith**

The Effect of Growth Mindset Intervention on Students’ Perceptions of Self Efficacy in a first-year general education science course. **J. Kavalakatt, N. Tran, J. Park, T. Nguyen, J. Chan**

WEDNESDAY

WALC
1055

Assessment and Measurement in Research and practice

K. L. Murphy, J. R. Raker, Organizers, Presiding

8:00 Introductory Remarks.

8:05 823. Capturing evidence of inclusive teaching in undergraduate STEM classrooms through an inclusive teaching observation protocol (ITOP). J.M. Mutambuki, C. Muteti


8:45 825. Factors that impact the difficulty of organic chemistry exam items: Item order and item environment effects. O. Michels, T.C. Pentecost, S. Nedungadi, J.R. Raker, K.L. Murphy

9:05 826. Applying and adapting a cognitive complexity rubric to physical chemistry exam items. M.S. Reeves, T.C. Pentecost, J.R. Raker, K.L. Murphy

9:25 Closing Remarks.
Chemistry Education Research: Graduate Student Research Symposium

M. Connor, O. Crandell, *Organizers, Presiding*

**8:00** Introductory Remarks.

**8:05 841.** Second-semester general chemistry undergraduate students ideas about polarity when viewing multiple molecular representations. C. Chatha, S. Bretz

**8:25 842.** Exploring modifications to scale-themed instruction in general chemistry II: Determining content area and scale concepts targets for increased scaffolding. A.R. Tomczyk, K.L. Murphy

**8:45 843.** Mapping Students' Chemical Thinking During Collaborative In-Class Tasks. M. Macrie-Shuck, V. Talanquer

**9:05 844.** Analysis of factors that influence success in introductory general chemistry: Relationship between factors and student's study habits in general chemistry. L. Laguerre Van Sickle, R. Frey, J. Edwards

**9:25** Closing Remarks.

**9:30** Break.

**11:00** Introductory Remarks.

**11:05 845.** Exploring Students’ Understanding of Electrophilic Aromatic Substitution Reactions. S. Kariyawasam Gamage, S. Mooring

**11:25 846.** Does a scaffold fit all? - Exploring students' engagement with a scaffolded task in relation to their prior knowledge. D. Kranz, M. Schween, N. Graulich

**11:45 847.** Does online learning impact students’ ability to draw mechanisms?. V. Scammahorn, M. Cooper, S. Houchlei
12:05 848. Supporting students to construct causal mechanistic explanations in the context of complex phenomena such as impact of solvents on rate of organic reactions. **K. Seth**, E.L. Day, S. Houchlei, M. Cooper

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.


2:25 850. Metabolism Instruction: Students’ REDOX knowledge transfer and attitude towards metabolism. **T. Jones**


3:25 Closing Remarks.

**WALC**
3121

**Communicating chemistry: Improving oral and written communication skills to foster academic and career success**

J. Thompson, B. Widanski, *Organizers, Presiding*

8:00 Introductory Remarks.

8:05 853. Posters as a Pedagogical Device to Foster Oral Chemical Literacy. **B. Widanski**, J. Thompson
8:25 854. Effects of video assignments on communication and community in an undergraduate chemistry course. **S. Post**, C. Schrank, K.J. McKnelly

8:45 855. Successes, challenges, and next steps of integrating communication skills taught from a stand-alone Chemical Communications course into subsequent courses. **J.W. Karr**, J.L. ODonnell

9:05 856. Fitting students for the world in which they will live: Development of a curriculum spanning seminar series. **D.K. Hoover**

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 857. Comparing delivery modalities of College to Career and Research course. **G.B. Ray**

11:25 858. Designing writing assignments for cognitive skill development. **J.B. Easter**

11:45 859. Annotated Writing Exemplars for Organic Chemistry Laboratory Reports. **A.P. Dicks**, C. Phillips, J. Bayne, D. Stone, A. Williams

12:05 860. Withdrawn

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.


2:25 862. Implementing K-12 Educational Tools in a Capstone (Senior Seminar) Biochemistry and Chemistry Classroom. **C. Chant**

2:45 863. Use of oral and written communication in general and organic chemistry courses. **B. Miller**
3:05 864. Immersion in the Chemical Biology Literature and Scientific Communication through Case Studies. **B. Blacklock**

3:25 Closing Remarks.

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**Engaging students in Analytical Chemistry - Curriculum and Cognition**

S. Oxley, *Organizer, Presiding*
L. Mier, A. M. Palmer, J. K. Robinson, *Presiding*

8:00 Introductory Remarks.

8:05 885. Chromatography Simulators for Teaching Analytical Separations. **C.A. Lucy**

8:25 886. A POGIL-Based Quantitative Analysis Laboratory Curriculum Utilizing Python via Google Colab. **L. Mier**

8:45 887. The idea generator: New topics in active learning laboratories generated through the investigative laboratory writing assignment. **L.H. Mielke**

9:05 888. Flipping the Analytical Classroom: Lessons from COVID. **M.B. Jensen**

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 889. Science meets soft skills: Active learning in the quantitative analysis laboratory. **S.M. Strickland**

11:25 890. Kinetics analysis of the isomerization of alpha and beta acids found in hopped beer. **P. Doolittle**
11:45 891. Incorporating Experimental Design into a Bioanalytical Chemistry Laboratory Course. J.K. Robinson

12:05 Panel Discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 892. Applications first: Using primary literature and case studies to promote critical thinking and scientific writing in instrumental analysis courses. S.E. Gray


2:45 894. Teaching industry ready skills in an Instrumental Methods course via independent student projects. J.L. Hawk

3:05 895. Analytical Chemistry Students’ Conceptions of Monoprotic Acid-Base Titration. D.N. Maxwell, E.A. Teich, S.A. Finkenstaedt-Quinn

3:25 Closing Remarks.

WALC
3138

Science Communication in Classrooms and in the Public (#SciComm)

S. Drury, L. Wysocki, Organizers, Presiding
S. A. Ryan, Presiding

8:00 Introductory Remarks.

8:05 954. Deliberation in the chemistry classroom: Developing science communication around socio-scientific issues. L. Wysocki, S. Drury

8:45 956. Preparing to Facilitate Deliberation. **A.M. Nienow**, P. Conners


9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 958. Undergraduate Course on Science Communication to the Public. **J. Sridhar**


11:45 960. Scientific storytelling: A general education course to teach science communication, writing instruction, and narrative building. **K.Y. Neiles**

12:05 961. Turning My Kitchen Into a Classroom. **J. Lee**

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 962. Using Popular Social Media Platforms to Empower Parents in their STEM abilities. **S.A. Ryan**

2:25 963. Five lines and 280 characters: Using Twitter to share chemistry concepts via limericks and other light verse. **C.J. Hayes**

2:45 964. Solar System Map. **B. Salles**

3:05 965. Making chemistry relevant to everyday life using the podcast Chemistry For Your Life. **M. Collini**
3:25 Closing Remarks.

WALC
3127

Writing to Promote Learning and Disciplinary Thinking in Chemistry

S. A. Finkenstaedt-Quinn, Organizer, Presiding
F. M. Watts, Presiding

8:00 Introductory Remarks.

8:05 997. Integrating a Conceptual Writing Assignment in General Chemistry I. P. Muisener


9:05 Panel Discussion.

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 1000. Characterizing Student Interactions During Peer Review and Revision. S.A. Finkenstaedt-Quinn, F.M. Watts, G.V. Szymczak Shultz


12:05 1003. Helping students synthesize chemistry with context through soundboarding. **A. Lolinco**, T. Holme

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 1004. A machine learning approach to exploring students’ writing about reaction mechanisms. **A.J. Dood**, F.M. Watts, G.V. Szymczak Shultz


3:05 Panel Discussion.

3:25 Closing Remarks.

WALC
1132

**Active learning implementation**

D. B. King, **Organizer, Presiding**

8:00 Introductory Remarks.

8:05 794. Use of real-world applications to improve in-class activities. **D.B. King**
8:25 795. A forensics capstone for general chemistry: enriching the lab experience and evaluating students' scientific skills. **A.A. Lam**, S. Eveland-Parrott


9:05 797. Case Study Classes: Incorporating NGSS into active-learning assignments in a large enrollment university general chemistry course. **L. Munro**

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 798. Creating Digital Interactive Card Sorts. **A. Green**

11:25 799. Effects of supplemental content-rich songs and crossword puzzles on secondary school students' performance, retention and interest in chemistry in Ondo State, Nigeria. **E.O. Ayeni**

11:45 800. Remote Learning and Laboratory Practices for AP® Chemistry. **L. Acampora**

12:05 801. Ohio University STEMStart: A Jump Start for First Year Science Majors. **C. Beck**

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 802. Tossing the Textbook. **E.L. Bailey**

2:25 803. Engagement in the Classroom and Student Learning. **L. Aronne**


3:05 805. Team-based learning large and small: Implementation across class sizes. **T. Legron-Rodriguez**, J. Donnelly
3:25 Closing Remarks.

3:30 Break.


3:50 806. Using LEGO® brick activities to increase active learning in the biochemistry classroom. **S. Austin, S. Christmas, C. Millar**


4:50 809. Static and interactive concept maps for general chemistry learning. **K. Nishida, R.M. Wong, O.O. Adesope**

5:10 Closing Remarks.

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**Advances in e-Learning, Digital Learning, and Online Chemical Education**

D. A. Canelas, *Organizer, Presiding*

8:00 Introductory Remarks.

8:05 810. Immersive Digital Learning in STEM Laboratory Courses. **E.M. Rezler, O. Yavuz-Petrowski, A.C. Perkins, J. Krill, J. Golden Botti**

8:25 811. Lab kit vs. Virtual Labs: An Investigation into Lab Delivery Methods for Online Students in Service Courses. **B.E. Jenkins**

8:45 812. Labflow & Visual Data: Student attitudes and experience working online with visual data. **A.M. Dark**
9:05 813. Integrating chatbots into the chemistry classroom. A. Lolinco, T. Holme

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.


11:45 816. Google forms, iPads, and retrieval practice: Small changes in the classroom for effective teaching. J.B. Eberle

12:05 Panel Discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 817. What I’m learning about myself: Student meta-reflections in organic chemistry. L.A. Morsch, B. McCollum, M.T. Wentzel


2:45 819. Lessons learned from design and implementation of a year-long online organic chemistry class. S.M. King

3:05 Panel Discussion.

3:25 Closing Remarks.

3:30 Break.

3:50 820. Experiences in developing online OER Preparatory Chemistry content during the pandemic and its applications to post pandemic hybrid learning. E. Lisitsyna, L. Poirot, R.E. Belford

4:10 821. The Fully Online BS and BA Degrees in Chemistry and Biochemistry at Arizona State University. S.T. Pillai, A. Austin, I.R. Gould, M. Zhu

4:30 822. The evolution of online chemistry education. D.A. Canelas

4:50 Panel Discussion.

5:10 Closing Remarks.

WALC 3122

Chemical Education Xchange: Engaging with Contributors

J. L. Holmes, Organizer, Presiding

8:00 Introductory Remarks.

8:05 827. An Invitation to Share Content with the ChemEd X Community. D. Cullen


8:45 829. Using Scientific Evidence and Real World Phenomena to Drive Instruction. K. Drury

9:05 830. Chemical Philately: A Perforated Picture of Chemistry. M.A. Morgan

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.
11:05 831. Strategies for Helping Students to Avoid Common Errors and Improve Their Understanding. **M. Farabaugh**

11:25 832. Getting Ahead of Common Misconceptions with Intentional Lesson Design. **N. Walsh**

11:45 833. I "Lava" Particulate Models. **M. Hemling**

12:05 834. Standards based grading: changing the culture of the high school chemistry classroom. **C. Husting**

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 835. ChemEd X: An Introduction to Chemical Education Xchange. **J.L. Holmes**

2:25 836. Teaching General Chemistry from an Applications Approach. **S.J. Donnelly**

2:45 837. ChemEd X is the activity platform we needed. **D.J. Campbell**

3:05 838. Exchanging Ideas with Chemistry Educators: Chemical Education Xchange. **M.J. Harvey**

3:25 Closing Remarks.

3:30 Break.


3:50 839. Open Science and Open Pedagogy: My Journey as a TYC Lead Blogger at ChemEdX. **C. Sorensen-Unruh**

4:10 840. Asynchronous Online Chemistry Promotes Equity and Inclusion. **K.E. Carrigan**

4:30 Panel Discussion.

5:10 Closing Remarks.
Course-Based Undergraduate Research Experiences (CUREs) in the chemistry and biochemistry teaching laboratory

A. Goodman, M. Pikaart, Organizers, Presiding

8:00 Introductory Remarks.

8:05 865. Researching slime in organic chemistry lab: A CURE project. A.P. Johanson


8:45 867. A library project for a first-year chemistry Course-embedded Undergraduate Research Experience (CURE) at Georgia Gwinnett College (GGC). A. Button, C.L. Anfuso, I.H. Krouse, B.C. Shepler

9:05 868. Catalyzing new research opportunities at a primarily undergraduate institution using a CURE in analytical chemistry. E.D. Niemeyer

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 869. Microplastics and the Cahaba River: Introducing students to environmental chemistry through curriculum-based research. J. Forakis, J. March

11:25 870. Applying Metagenomics to Undergraduate Research: A Bacterial Profile of Soil Samples from the Potomac River Basin. A. Taraboletti

12:05 Panel Discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 872. An Authentic Research and Online Publication Experience in the Undergraduate Biochemistry Lab: Student and Instructor Perspectives. B. Hall

2:25 873. Lowering the activation energy: introducing a CURE in multiple small steps at a small, primarily undergraduate liberal arts college. A.A. Carter, P.A. Craig

2:45 874. Design, synthesis and analysis of small molecule inhibitors of quorum sensing in Vibrio bacteria: a year-long course-based undergraduate research experience (CURE) for first- and second-year students. L.C. Brown

3:05 875. A win-win collaborative interdisciplinary Course-based Undergraduate Research Experiences (ci-CUREs) program for undergraduates: Training undergraduate students to effectively navigate across traditional discipline boundaries. G. Rabah, S. Franzen

3:25 Closing Remarks.

3:30 Break.


3:50 876. Course-based Undergraduate Research in a Small Liberal Arts Undergraduate Institution. X. Song

4:10 877. Teaching the Nature of Science to Nonmajors Through a Course-based Undergraduate Research Experience. M.J. Harvey

4:30 878. A look at moving to University designated CURE courses within the Chemistry and Biochemistry Department at Weber State University. T.M. Covey
4:50 879. Investigation of Research and Time Commitment Aspect of CUREs Beyond the CURE. A. Ayella

5:10 Closing Remarks.

WALC
2007

Exploring strategies for decreasing DFW rates in General & Organic Chemistry

E. S. Eitrheim, A. L. Waters, Organizers, Presiding

8:00 Introductory Remarks.

8:05 896. Analyzing Factors for First Semester General Chemistry Student Success at the University of Central Oklahoma. A.L. Waters, E.S. Eitrheim, T. Cook

8:25 897. Strategies to move the needle for at-risk students and lower the DFW rate in general chemistry. B. Augustine, H.B. Miller, T. Knippenberg

8:45 898. One-semester general chemistry increases completion rate compared to two semesters. W. Kennerly, K. Sheppard, K. Frederick

9:05 899. Impacting Student Success in General Chemistry I: Using a Co-Requisite Support Course. R.J. Weber

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 900. Bridging the Gap for Students Transitioning Between General Chemistry and Organic Chemistry. M.K. Maron

11:45 902. Two decades of improving the DFW rate in organic chemistry at Elon University: Organizing by mechanism, flipping the classroom, adopting an online homework system, and facilitating a growth mindset. **J.M. Karty**


12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 904. A Mid-Semester Alternative for At-Risk Students in Introductory Chemistry. **J. Morris**

2:25 905. Implementation of a Remedial General Chemistry I Intersession Course on Preparing Students for General Chemistry II. **M. Jaffe**


3:05 907. Incorporating Study Hall into the General Chemistry Program at Tennessee Tech University. **A.J. Carroll**, E. Alonge, L. Kocher, C. Rezsnyak, K. Rust

3:25 Closing Remarks.

3:30 Break.


3:50 908. Reading in chemistry: How students can succeed. **L.E. Johnson**, B.A. Lucius, T. Habeck, F. Diawara, A. Blecking

4:10 909. Determining the effect of spaced retrieval practice in introductory chemistry courses. **L. Hoyt**

4:30 910. Improving student learning and course appreciation in General and Organic Chemistry. **J.P. Lanorio**

4:50 Panel Discussion.
5:10 Closing Remarks.

STEW
310

Incorporating diversity, equity, inclusion, and respect (DEIR) learning opportunities in the chemistry classroom

A. Nakamura, K. R. Ries, Organizers, Presiding

8:00 Introductory Remarks.

8:05 919. Effects of teaching the United Nation’s Sustainable Development Goals in undergraduate chemistry classroom. A. Nakamura

8:25 920. Exploring impacts of influences upon students' mindsets and personality characteristics. D.J. Nelson

8:45 921. Integrating antiracism, social justice, and equity themes throughout an undergraduate biochemistry course. J.M. Liu, C. Hollond, R. Sung, S. Hollar

9:05 Panel Discussion.

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 922. Sarah Reisman, titan of organic synthesis: inculcating the contribution of female scientists in sophomore organic chemistry. S. Chamberland

11:45 924. Navigating a Homogenous History: Belonging and Empowerment in Undergraduate Chemistry. **S.N. Knezz**


12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 926. Conversations About Bringing Racial and Social Justice into a General Chemistry Classroom at an Open-Access Metropolitan Commuter Community College. **A. Glass, K. Wittman Howell**

2:25 927. Decolonizing Chemistry: Rethinking the Language of Chemistry. **P. Gittins, R.M. Hanson**

2:45 928. Challenges of Inclusivity and Diversity. **E.A. Nalley**

3:05 Panel Discussion.

3:25 Closing Remarks.

3:30 Break.


3:50 929. Teaching chemistry through a DEIR lens. **E.A. Arriaga**

4:10 930. Withdrawn


4:50 Panel Discussion.

5:10 Closing Remarks.
Research in Chemistry Education

M. Anzovino, J. H. Carmel, Organizers, Presiding

8:00 Introductory Remarks.

8:05 938. Impact of simulation order on general chemistry students’ cognitive engagement while completing a dissolving simulation activity. K.J. Linenberger Cortes, K. Barbee, A. Randolph, C. Terrell


8:45 940. First-year students' epistemologies on the structure of chemistry knowledge linked to problem solving strategies: A think aloud study. A. Lekhi, S. Nashon, M. Milner-Bolotin

9:05 941. Understanding Discourse Patterns in a Small Discussion Course. H.T. Nennig, R.S. Cole

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 942. How academic self-efficacy and metacognitive learning strategies affect the academic performance of college students in chemistry. O. Fayeun, O.O. Babajide

11:25 943. Development of semi-structured student interviews for insight into student problem-solving in key general chemistry II content areas. A.R. Tomczyk, K.L. Murphy

12:05 945. Modeling Abstraction in Physical Chemistry Instruction. J. Karch, H. Sevian

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 946. Investigation into the paths students engage in to predict molecular shape and how molecular representations relate to such paths. A. Farheen, S.E. Lewis


2:45 948. The Role of Chemical Representations in General Chemistry Textbooks on Students' Learning. B. DEMIRDOGEN, G. DEMIRCAN AKMAN

3:05 949. What does it mean to capture and characterize representational competence? An analysis of how students reason about representations of molecular structure. M. Popova, L. Wright Ward, F. Rotich, J. Hoang

3:25 Closing Remarks.

3:30 Break.


4:50 953. Influence of spatial aptitude on student success in organic stereochemistry. E.N. Kadnikova

5:10 Closing Remarks.

WALC
3090

Teaching Programming in the Chemistry Curriculum: Approaches, Challenges, and Best Practices

J. A. Nash, Organizer
A. Ringer McDonald, Presiding

8:00 Introductory Remarks.


8:45 968. Introducing chemistry students to programming concepts using MATLAB Live Scripts. K.D. Closser

9:05 969. Teaching chemistry majors to code in physical chemistry lab. M.N. van Staveren

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.
11:05 970. Accelerating Chemical Discovery: Teaching Undergraduate Chemistry Through the Lens of Data Science. B. Rubenstein, J. Ho, S. Anisetti, M. Trouilloud, D. Lu

11:25 971. Project-based learning in an Internet of Chemistry Things special topics class. E. Lisitsyna, L. Poirot, H. Tiner, E. Bouzid, P. Williams, R.E. Belford

11:45 972. Incorporating Programming as a Transferable Skill and Tool for Active Learning in a Graduate Physical Chemistry Elective Course on Molecular Modeling. S.E. Mason

12:05 973. Jupyter Pandas GUI: Open Source Graphical User Interface Tools to Facilitate Using and Teaching Python Data Analysis, Visualization and Fitting. J.H. Gutow

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 974. Blending Data Structures and Organic Chemistry. S. Sharif


2:45 976. Techniques and insights on teaching Python programming for chemists. A.J. Bonham

3:05 977. Python Scripting for Biochemistry and Molecular Biology. P.A. Craig

3:25 Closing Remarks.

3:30 Break.


3:50 978. Teaching a Dedicated Programming Course for Chemistry Students. C. Weiss

4:10 979. A modular approach to introducing Python coding in a lower division analytical chemistry course. E. Gillette, J.A. Schafer, D.O. Dehaan

4:50 981. Programming Education Resources from the Molecular Sciences Software Institute. **J.A. Nash**

5:10 Closing Remarks.

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WALC
2051

**Trends in GOB Chemistry**

L. D. Frost, *Organizer, Presiding*
C. E. Brown, L. Eaton, A. Murkowski, K. S. Owens, *Presiding*

8:00 Introductory Remarks.

8:05 982. Let's Teach Chemedistry!. **W.D. Urban**

8:25 983. Strategies for Teaching the B in GOB Chemistry. **C.E. Brown**

8:45 984. Development and Implementation of a COVID mRNA Vaccine Case Study for GOB Students in Remote and Hybrid Synchronous Teaching. **S. Dunham**

9:05 985. What I learned about introductory GOB by teaching practicing nurses. **L.D. Frost**

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 986. Using POGIL to increase student engagement and belonging in Allied Health both online and F2F. **A.B. Mahoney**, M. Garoutte

11:45 988. Curricular and Pedagogical Strategies for Engaging GOB Students in Interdisciplinary Learning Activities. **K.S. Owens, A. Murkowski**

12:05 989. Teaching GOB students how take the lead in their own learning. **K.E. Carrigan**

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 990. Technology-based strategies to build a community of learning in a GOB course. **C. Patel**

2:25 991. Gamification of math content in a GOB course. **B. Lybbert**

2:45 992. Exploring how students connect symbolic equations, vocabulary and molecular-level representations in a first-semester GOB course. **M.E. Jewell**

3:05 993. The impact of emotions on pre-nursing students success in a GOB chemistry course. **C.E. Brown, S. Nedungadi, A. Graves**

3:25 Closing Remarks.

3:30 Break.


3:50 994. Spike protein to ferritin: A scaffolded approach to develop a deeper appreciation of proteins. **S.A. Mason**

4:10 995. Using canola oil as a replacement for hazardous non-polar alkanes in testing the solubility and miscibility of organic and inorganic substances in the undergraduate GOB chemistry laboratory. **M.R. Korn**

4:30 996. GOB chemistry curriculum. **S. Narayan**

4:50 Panel Discussion.
5:10 Closing Remarks.

STEW
313

Educational Research in the High School Science Classroom

M. E. Jewell, M. L. Miller, Organizers, Presiding

8:00 Introductory Remarks.

8:05 880. Incorporating Action Research into the M.S. Chemistry – Chemistry Education program at South Dakota State University. M.E. Jewell, M.L. Miller

8:25 881. Teachers as researchers; implementing action research into the chemistry classroom. R. Johnson

8:45 882. Take "OAIM" and Fire: The OAIM Method for Procedure Writing and Its Effectiveness. L. Detwiler

9:05 Panel Discussion.

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 883. Understanding High School Students’ Misconceptions about Chemistry using Particulate Level Drawings: Focusing on the Third Angle. S. Smith

11:25 884. Chemistry Content Knowledge And Verbal Analogical Reasoning As Potential Predictors Of Teachers’ Quality Of Chemistry Concept Analogies. S. Asenjo

11:45 Panel Discussion.
Functional Groups: Collaborative learning in organic chemistry and related subjects

J. L. Kiappes, Organizer, Presiding

8:00 Introductory Remarks.


8:25 912. Incorporating groupwork and inquiry into organic chemistry lab. M.A. Vanalstine-Parris

8:45 913. Collaborative Huddle Engaging Magnification: CHEM. K. Johnson


9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 915. Conversations about flipping an organic chemistry classroom in the midst of a pandemic. K.M. Slunt, J.A. Asper

11:25 916. Collaborative activities encourage higher order thinking in biochemistry. J. Fishovitz

11:45 917. Collaborative workshops in introductory organic chemistry: Empowering students to solve chemical biology research questions. J.L. Kiappes
12:05 918. Peer-led small group discussions facilitate improved student learning in organic chemistry. **J.A. Martinez, S. Davis, S.A. Dandekar**

12:25 Closing Remarks.

STEW 307

**Overarching undergraduate curriculum reform**

B. B. Harmon, N. L. Powell, *Organizers*
D. R. Mulford, *Organizer, Presiding*

8:00 Introductory Remarks.

8:05 932. Implementation and assessment of a merged organic and general chemistry four-semester sequence for a health science degree. **X. Prat-Resina**


8:45 934. Flexible curricular reform: How different implementations can achieve the same goals. **D.R. Mulford**, N.L. Powell, B.B. Harmon

9:05 Panel Discussion.

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 935. The INSPIRE program: creating STEM undergraduate cohorts to promote interdisciplinary research and collaborations. **W.E. Schatzberg**

11:45 937. Applied Science, an Alternative Approach to Chemistry Education. J. Frost

12:05 Panel Discussion.

12:25 Closing Remarks.

PMU
North Ballroom

General Posters 5

M. T. van Opstal, Organizer, Presiding

9:30 - 10:30

1007. Is the glassware “rinse three to four times with deionized water” clean enough?. K. Qiu, S. Wang

1008. Modes of undergraduate research; Which one serves students the best?. C.A. Barta

1009. Using in-class activities in a 1-semester biochemistry class to improve student engagement and learning. R. Bouley

1010. Withdrawn

1011. Practical examples of constructively responsive reading instruction to promote metacognition when learning industrial and environmental chemistry. S.R. Esjornson

1012. Is classroom engagement a predictor of overall course performance?. R. Rosa Tavares Rodrigues, D. King

1013. Team Science in Undergraduate Education. C. Andersen, J.P. Walker

1014. Learning Diversity, Equity, and Inclusion Through General Chemistry: Course Materials Development via Renewable Assignments. S. Sun, J. Kaiser, A. Meier
1015. Stakeholder Interpretations of Scientific Information Literacy: Surveying Orange and Seminole County K-16 Educators. B. Chiu, C. Randles


1017. Minoritized Students’ Sense of Belonging in Post-secondary General Chemistry. T. Hanson

1018. Project CASE (Collaborating Around STEM Engagement), An Outreach Program. W.C. Deese

1019. 3D IMAGINE - Creating 3D tactile images to teach STEM courses to visually impaired. E. Hasper

1020. Determining the Color Changes of pH Indicators Using a Spectrophotometer. H. Lee, H. Kim

1021. General chemistry students’ perceptions of remote/online v. in-person education during the COVID-19 pandemic. A. Ly, M. Orgill

1022. Engineering interactive learning in the general chemistry laboratories at Texas A&M University (TAMU). A.C. Songok, E. Lee, A. Altemose


1024. Teaching Organic Chemistry Undergraduate Laboratory Curriculum by theme-based sunscreen project. D. Butani, M. Nelson, R.S. Muthyala

1025. Using POGIL and 3D Models to Teach Orbital Hybridization in Undergraduate General Chemistry. R.S. Thompson, S.A. Toledo

1026. Meeting students’ needs? Implementing reading interventions in introductory chemistry and its impact on student performance. F. Diawara

1028. Discourse analysis of student thinking about molecular polarity when offered sequential or simultaneous exemplars with and without electrostatic potential maps. **C.L. Lavoie, C.F. Bauer**


1030. Beyond the teaching lab: A lecture teaching fellowship for graduate students. **S. Moon**

1031. Culturally Relevant and Socially Responsible Design of Organic Chemistry Laboratories Curriculum. **C.L. Velez**

1032. A Physical Chemistry course for non-Physical Chemists. Active learning strategies using Python and Jupyter Notebooks. **X. Prat-Resina**


1034. Investigating the differences in use of Learning Assistants on students’ chemistry identity development. **G.S. Rophail, J.H. Carmel**

1035. Speed and Accuracy vs. Cost: A Solids Analysis Investigation. **D.F. Fraley**


1037. Using case studies in Chemistry Education: The examples of Water Resources and Mining. **M. Silva de Lima, S. Queiroz, L.L. Pozzer**

1038. Creating a Course-based Undergraduate Research Experience (CURE) for the Inorganic Lab. **L.C. Williams, A. Saha**

WALC
1018

**Assessment Instruments: Design, Development, and Evaluation**
M. Atkinson, J. Barbera, *Organizers, Presiding*

**11:00 Introductory Remarks.**

**11:05 1039.** Exploring the factor structure of the Meaningful Learning in the Laboratory Instrument (MLLI). **E.B. Vaughan**, J. Barbera


**12:05 1042.** Evaluation of the Academic Motivation Scale-Chemistry via contrasting Likert-scale and rank-sort approaches. **Y. Wang**, **S.E. Lewis**

**12:25 Closing Remarks.**

**12:30 Lunch.**

**2:00 Introductory Remarks.**

**2:05 1043.** Design and evaluation of a measure of student engagement in active learning activities. **N. Naibert**, J. Barbera

**2:25 1044.** Development of a chemistry-specific mindset instrument. **D. Santos**, S. Mooring, J. Barbera

**2:45 1045.** Developing the Intelligence Mindset in the Chemistry Laboratory Assessment. **S. Fullington**, S. Bretz

**3:05 1046.** Developing and Validating a Survey on Students’ Experiences and Understanding of the Culture of Scientific Research and Racial Identity. **P. Vincent-Ruz**, K. Hosbein, J.L. Dewey, R.S. Phillips

**3:25 Closing Remarks.**

**3:30 Break.**

**3:45 Introductory Remarks.**


5:10 Closing Remarks.

STEW
202

Moving towards anti-deficit framing in our research and practice (#AdvancingEquityinCER)

K. Hosbein, M. E. Howe, C. Stachl, Organizers
V. R. Ralph, S. M. Werner, Presiding

11:00 Introductory Remarks.

11:05 1051. One scholar’s journey to reframe previous work to anti-deficit, equity-centered research. S.M. Werner


11:45 1053. Thinking with agential realism and variation theory to investigate representational practices in biochemistry teaching and learning. S. Wang, R. Sung, T.J. Bussey
12:05 Panel Discussion.

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 1054. Asset-Based and Anti-Deficit Methods for the Iterative Evaluation of a Professional Development Workshop. J. Tashiro, S. Pazicni

2:25 1055. Using Intersectionality as a heuristic in an Institutional Ethnographic Investigation: Implications for equity research in STEM education. C.E. Wright


3:05 Panel Discussion.

3:25 Closing Remarks.

3:30 Break.


3:50 1057. Promoting an equity-minded Approach to Advancing racial equity in chemistry education. j. collins

4:10 1058. Investigating chemistry culture from the perspective of PEERs. C. Ngai

4:30 1059. Impact of science specialized first-year course in the development of first-year Science students. Z.S. Wilson-Kennedy, J. Zhan, R. Davis

4:50 Panel Discussion.

5:10 Closing Remarks.

STEW
206
Process Oriented Guided Inquiry Learning (POGIL) in the classroom & laboratory

M. D. Perry, Organizer
L. E. Parmentier, Presiding

11:00 Introductory Remarks.


12:05 1063. Gamified Process Oriented Guided Inquiry Learning Activities (GpA) in a Large Enrollment Chemistry Course. N. Turner, T. Gupta, M.E. Jewell

12:25 Closing Remarks.

12:30 Lunch.

2:00 Introductory Remarks.

2:05 1064. Implementing cyber POGIL and PLTL to improve resilience of teaching chemistry in Puerto Rico. C. Rivera-Maldonado, C. Peraza González, L. Méndez-Torres


2:45 1066. Student centered collaboration online in an introductory chemistry course. L. Eaton

3:05 1067. Synchronous hybrid POGIL teamwork: Implementation and impact on student learning in General Chemistry. S.U. Dunham
3:25 Closing Remarks.

3:30 Break.


3:50 **1068.** Flipping a traditional 'cookbook' style lab manual into a POGIL style lab manual. **T. Hanson**

4:10 **1069.** Melting thermodynamics and molecular structure: a POGIL laboratory activity. **J.P. Hagen**

4:30 **1070.** Creating Engaging General Chemistry Polymer Laboratories: POGIL Model and Student Voice. K. Mardis, **A.G. Van Duzor**

4:50 Panel Discussion.

5:10 Closing Remarks.

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**Active Learning in Organic Chemistry**

A. Leontyev, *Organizer, Presiding*

2:00 Introductory Remarks.

2:05 **1071.** Development of a poly(lactic acid)/nylon 6-6 polymer synthesis experiment for organic chemistry. **S.A. Henrie,** J.H. Davis, N.C. Dalton

2:25 **1072.** Gamification in the Organic Laboratory as an Answer for Apathy and Pandemic. Going Full Circle. **C. Arias**

2:45 **1073.** Chem101 in Organic Chemistry II: Part of the Kitchen Sink approach. **P. Wiget**

3:25 Closing Remarks.

BRWN
1154

Beyond the Laboratory Teaching Assistantship: How can we prepare our graduate students for teaching outside of the laboratory?

R. Broyer, Organizer
S. N. Knezz, J. A. Parr, Presiding

2:00 Introductory Remarks.

2:05 1075. Creating professional development to mitigate teaching anxiety and discomfort in graduate teaching assistants. A. Sona, M. Kwaschyn, E. Saitta

2:25 1076. The influence of community on graduate student socialization as teachers in the chemical sciences. C. Schnoebelen, N. Suarez, S. Brydges


3:05 1078. Pandemic policies bring endemic effects: Lasting changes in the post-COVID classroom. C. Barrett, R. Broyer

3:25 Closing Remarks.

3:30 Break.

3:50 1079. AcademiNext: Emerging Faculty Development Program. R. Broyer, J.A. Parr

4:10 1080. A classroom teaching fellowship: The graduate student's perspective. S. Moon

4:30 1081. The Institute for Future PUI Faculty: A case study about participants' career motivations and perceptions during Lafayette College's new professional training program. M.A. Bertucci

4:50 Panel Discussion.

5:10 Closing Remarks.

Cognitive resources for understanding students: How to and what for?

A. C. Moon, S. Mooring, Organizers, Presiding

2:00 Introductory Remarks.

2:05 1082. Why Assumptions About the Nature and Structure of Knowledge Matter for Research and Teaching. J. Rodriguez

2:25 1083. Organic chemistry students’ cognitive resources for making inferences about stability. F. Rotich, C.C. Onokalah, L. Wright Ward, M. Popova

2:45 1084. Investigating undergraduate chemistry students’ cognitive resources for reasoning about graphical representations. N.M. Becker, J. Rodriguez, S.J. Hansen

3:05 1085. Exploring Epistemic Resources in Research and in Teaching. R.M. Kelly, J. Kim

3:25 Closing Remarks.
3:30 Break.


3:50 **1086.** Investigating how molecular orientation affects students' cognitive resources for identifying reflection and rotation symmetry elements. **O. Crandell, S. Pazicni**

4:10 **1087.** How students predict SN1, SN2, E1, and E2 reaction mechanisms through the lens of coordination class theory. **K. Hunter, N.M. Becker**

4:30 **1088.** “To Be Honest, I Didn’t Even Use the Data”: Organic Chemistry Students’ Engagement in Data Analysis and Interpretation. **J. Zhou, A.C. Moon**

4:50 **1089.** Exploring Student Mechanistic Reasoning through the Evidence-Based Design of Carbonyl Activation Case Studies. **S. Petritis, E.L. Day, M. Cooper**

5:10 Closing Remarks.

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**STEW 311**

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**Exploring the implementation of Peer-Led Team Learning and the diverse outcomes that result**

C. F. Bauer, K. A. Bowe, S. E. Lewis, *Organizers, Presiding*

2:00 Introductory Remarks.

2:05 **1090.** Born in the USA - Exploring the PLTL Model in U.K Higher Education. **L. Howell, R. Shahid**

2:25 **1091.** Transferrable skills gained from experience as a peer-leader in a PLTL program: A mixed-methods study of LinkedIn users. **A. Chase, D. Maric, A.S. Rao, G. Kline, P. Varma-Nelson**

3:05 1093. PLTL students as partners in creating learning activities for cross-disciplinary scientific and mathematical practices. C.F. Bauer, M. Aikens, J. Kustina, D. Meredith, K.A. Bowe, A. Gaudreault, N. Altindis

3:25 Closing Remarks.

3:30 Break.


3:50 1094. Can artificial intelligence (AI) be used to monitor and enhance cPLTL workshops?. P. Varma-Nelson, K. DSouza, S. Mukhopadhyay, S. Fang, L. Zhu

4:10 1095. An evaluation of online Peer-Led Team Learning to promote student success. J. Young, S.E. Lewis


4:50 1097. If all you have is covalent bonding, every substance is a molecule: Longitudinal study of student enactment of covalent and ionic bonding models. K.A. Bowe, C.F. Bauer, Y. Wang, S.E. Lewis

5:10 Closing Remarks.

STEW
313

Molecular-Level Animations in Secondary Chemistry: VisChem Teacher Showcase

R. Tasker, E. J. Yezierski, Organizers
K. Q. Magnone, M. M. Wu, Presiding
2:00 Introductory Remarks.


2:45 1100. Connecting the intermolecular dots: Using the VisChem Approach to address student misconceptions of intermolecular interactions and particulate chemical modeling. R. Johnson, M.M. Wu, K.Q. Magnone, J. Ebert, E.J. Yezierski

3:05 1101. May the force be with you: Using VisChem animations to teach intermolecular forces. A.J. Hanson, M.M. Wu, K.Q. Magnone, J. Ebert, E.J. Yezierski

3:25 Closing Remarks.

3:30 Break.


4:10 1103. Helping students visualize and understand precipitation reactions using drawings and animations. S. Richardson, M.M. Wu, K.Q. Magnone, J. Ebert, E.J. Yezierski

4:30 1104. Using the VisChem Approach to help students understand the role of electrostatic attractions between oppositely charged ions in ionic substances. A. Mital, M.M. Wu, K.Q. Magnone, J. Ebert, E.J. Yezierski


5:10 Closing Remarks.
Why and/or how do the flipped classroom influence student learning and faculty success in chemistry classes and laboratories?

R. S. Perera, Organizer, Presiding

2:00 Introductory Remarks.

2:05 1106. Flipping the Large (and Small) Undergraduate Lecture: Strategies and Lessons Learned. A. Herring, M.J. Bojan, L. Funari

2:25 1107. Flipped Classroom, Active Learning, and Enhanced Feedback – A Classroom to Laboratory and Back Approach. D.M. West

2:45 1108. Using PhET Simulations as Exploratory Models: Leveraging the Flipped Classroom Structure to Build Conceptual Understanding in a Large Enrollment General Chemistry Course. J.F. Eichler, E.J. Yezierski

3:05 1109. Exploring Student perspectives of the flipped classroom pre-class video. N. Burrows

3:25 Closing Remarks.

3:30 Break.


3:50 1110. Flipped Across the Curriculum. L.M. Ponton

4:10 1111. How to Look for Flippable Moments in Your Class and Backward Design Process.. R.S. Perera

4:30 Panel Discussion.

5:10 Closing Remarks.
Equitable and Student-Centered Assessments

J. Brown, M. Farabaugh, *Organizers, Presiding*

**3:45** Introductory Remarks.

**3:50 1112.** Assessment Design in General Chemistry II. **P. Muisener**

**4:10 1113.** Mastery-based grading across a first-year chemistry sequence at Grand Valley State University. **B.K. DeKorver**, S. Clark, J. Henderleiter, N.J. Barrows

**4:30 1114.** Ungrading in the Chemistry Lab: Using Digital Notebooks and Team Dashboards to Improve Formative Feedback. **P. Gittins**

**4:50 1115.** Toward Equitable Assessment of English Language Learners in Chemistry: Identifying Challenging Features in Assessment Items. **E. Lee**, M. Orgill

**5:10** Closing Remarks.

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Methods for Characterizing Epistemology in Chemistry Education Research

K. DeGlopper, *Organizer*
R. Stowe, *Organizer, Presiding*

**3:45** Introductory Remarks.


4:30 1118. Using a scaffolded critiquing task to promote engagement in metamodeling knowledge: Analyzing how students reason with and about chemical bonding models. **V. Bapu Ramesh**, J. Rodriguez, N.M. Becker

4:50 1119. A research methodology to explore students’ guiding epistemology and conceptualization of disciplinary context when problem solving. **A.P. Parobek**, P.M. Chaffin, M.H. Towns

5:10 Closing Remarks.

**THURSDAY**

WALC
3138

**Oral communication in the chemistry curriculum**

G. Crawford, K. D. Kloepper, *Organizers, Presiding*

8:00 Introductory Remarks.

8:05 1150. Communication skills enhancement through a variety and progression of presentations. **R. Morgan Theall**

8:25 1151. Enhancing oral communication: Storytelling in the chemistry classroom. **E. Vickers**
8:45 1152. Developing informal technical communication: Oral lab reports in organic chemistry. **L. Wysocki, S. Drury**

9:05 1153. Reflecting on increasing oral communication opportunities and assessments in an inorganic chemistry laboratory. **J.L. ODonnell, J.W. Karr**

9:25 Closing Remarks.

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**3D Printing in Chemical Education: Engaging Students and Creating Tools for Active Learning**

L. A. Porter, *Organizer, Presiding*

8:00 Introductory Remarks.

8:05 1120. 3D Printing Workshops: A fun and hands on way of aiding student understanding of representation, shape and chirality. **R. Blackburn, R. Britton**

8:25 1121. 3D Printed Models of Atomic, Hybrid, and Molecular Orbitals. R. De Cataldo, K.M. Griffith, S. Flagg, R. King, **K.H. Fogarty**

8:45 1122. Training Exercises for 3D Printed Space-Filling Molecular Models. N. Nolan, H. Martin, **J.K. Klosterman**

9:05 1123. Integration of 3D-Printed Optomechanics Kits into an Advances Instrumental Analysis Course. **T.J. Bixby**

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.
11:05 1124. Improving laboratory education with 3D-printable smartphone spectrophotometers. **A.W. Smith**


11:45 1126. Developing an Entrepreneurship Infused Digital Fabrication Course at Millikin University. **K.N. Knust**

12:05 Panel Discussion.

12:25 Closing Remarks.

**WALC 1132**

**Active learning implementation**

D. B. King, *Organizer, Presiding*

8:00 Introductory Remarks.

8:05 1127. Orgo for the 21st Century: A Student-Centered Course on Advanced Reactivity. **A. Neuman**, A. Scharf

8:25 1128. Lessons from flipped classroom incorporation in a large enrollment inorganic lecture course. **M.R. Porter**

8:45 1129. Withdrawn


9:25 Closing Remarks.

9:30 Break.
11:00 Introductory Remarks.

11:05 1131. The use of surveys to identify self-learned material to open time for in-class activities. M. Delgado, F. Germain

11:25 1132. Using Quasi-active Learning to Improve Students' Learning in Chemistry. Y. He

11:45 1133. What can we learn from the personal characteristics of instructors who implement evidence-based instructional practices?. B. Morgan, M. Weinrich


12:25 Closing Remarks.

WALC
3127

Encoiling Research and Practice to Understand and Improve Inorganic Chemistry Education

J. M. Pratt, J. L. Stewart, Organizers, Presiding

8:00 Introductory Remarks.

8:05 1135. An Alternative to Using \(d\)-orbitals to Describe Bonding in Main Group Compounds. S. Pazicni

8:25 1136. Supporting the inclusion of solid-state chemistry in introductory courses. J.T. Race, P. Woodward, T.M. Clark

9:05 Panel Discussion.
9:25 Closing Remarks.
9:30 Break.
11:00 Introductory Remarks.
11:05 1138. Quick Writes for High Level Comprehension. J.F. Dunne
11:25 1139. Literature-based problem sets and exams questions in the inorganic curriculum. J.L. ODonnell
11:45 1140. Lessons learned from a utility-value intervention in inorganic chemistry. Y. Wang, S.E. Lewis
12:05 1141. A preliminary study on the strategies that students use to solve complete-the-reaction inorganic tasks. H.P. Lundien
12:25 Closing Remarks.

WALC
1018

Fun-tastic Games and How to Make/Use Them

T. D. Gaines, Organizer, Presiding
R. M. Doughty, P. Lee, Z. Thammavongsy, Presiding

8:00 Introductory Remarks.
8:05 1142. Acids to acids: An Apples to Apples™ inspired game to aid in pKa identification. A.L. Courtney
8:25 1143. Escape Room Mania! Incorporating escape rooms in the classroom and the teaching laboratory. M.J. Vergne
8:45 1144. Atoms to Atoms: A game-based classroom activity to check for understanding prior to a formal exam. B. Miller

9:05 1145. Project Lockbox: Adapting an escape-room-style activity to different content types, course levels, and class sizes. R.M. Doughty

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 1146. Chemistry Games Tailored for the Inorganic Chemistry Classroom. Z. Thammavongsy


12:05 1149. Use of Chemistry Card Games in the classroom to enhance learning and retention. M. Clark, J. Cotter

12:25 Closing Remarks.

WALC
3087

Research in Chemistry Education

M. Anzovino, J. H. Carmel, Organizers, Presiding

8:00 Introductory Remarks.
8:05 1154. Deploying 21st century skills in the learning and teaching of chemistry: where do Nigerian serving and preservice teachers stand?. **K. Oloruntegbe**

8:25 1155. An Analysis of the Teaching Experiences of Instructors Within One Chemistry Department During the COVID-19 Pandemic. **L. Wright Ward, J. Hoang, M. Popova**

8:45 1156. Understanding of Virtuosity in Science Teaching and Developing Virtuoso Science Teacher: A Comparative Case Study Of Understanding Excellence In Teaching Practice. **E. Ozyurek**

9:05 Panel Discussion.

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 1157. Use Of Advance Organiser On Gender Variables In Teaching Chemistry In Secondary Schools In Nigeria. **A.O. OMONIYI**


11:45 1159. Results from a national survey on instrumentation use in undergraduate laboratory courses. **M. Connor, J.R. Raker**

12:05 1160. Does a spectrum of STEM Education Research exist?. **R. Lindell**

12:25 Closing Remarks.

**WALC 1132**

**Using Computational Chemistry to Improve Student Understanding of Chemical Reactions**
B. J. Esselman, N. J. Hill, *Organizers, Presiding*

8:00 Introductory Remarks.

8:05 1161. The Compute-to-Learn Pedagogy. **D.M. Hassan**, K. Lenn

8:25 1162. Molecular modeling of chemical reactions from high school to physical chemistry courses. **L. Tribe**

8:45 1163. Undergraduate Chemistry Lab - Using Ab Initio Calculations to Predict Chromatographic Outcomes. **R. Karugu**

9:05 1164. Analyzing infrared and NMR spectra of organic molecules with WebMO and Gaussian. **K. Range**

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 1165. Implementing computational chemistry in large organic chemistry laboratory classes: Methodology, exercises, and expanding usage to other courses. **L.M. Goldman**, A.B. McCoy, S. Stoll


11:45 1167. Integrating computational chemistry into organic lecture and problem solving sessions. **A. Ellison**, B.J. Esselman, R. Stowe

12:05 Panel Discussion.

12:25 Closing Remarks.
Utilizing scientific literature to develop reading comprehension skills, writing efficacy, and content knowledge.

C. Johnson, M. M. Morgan, E. P. Wagner, *Organizers, Presiding*

**8:00 Introductory Remarks.**

**8:05 1168.** Tracking information literacy in science students: reinforcing skills through literature-based assignments in General Chemistry and Biochemistry. *J.D. Knight*, M. Bruehl, D. Pan, S. Budd

**8:25 1169.** Two Literature Review Projects for Organic Chemistry. *L.J. Silverberg*

**8:45 1170.** Teaching Students to Read the Primary Literature Using POGIL Activities. *T.A. Murray*

**9:05 1171.** Developing Scientific Writing Abilities Through Guided and Active Learning Cycles in the Physical Chemistry Laboratory. *C. Johnson*, E.P. Wagner

**9:25 Closing Remarks.**

**9:30 Break.**

**11:00 Introductory Remarks.**

**11:05 1172.** Writing Skills Development in General Chemistry using Scientific Literature. *M.M. Morgan*, G. Murray, C. Johnson, E.P. Wagner

**11:25 1173.** Development of a scientific writing course for chemistry and biochemistry majors. *S. Pierce*

**11:45 1174.** A Long Term Project is an Excellent Way to Add the Primary Literature into a Lab Course. *D.J. Slade*

**12:05 1175.** Switching to Specs: The Process of Modifying Writing-Intensive Upper Division Chemistry Courses to Use Specifications Grading. *S. Mang*

**12:25 Closing Remarks.**
We want YOU for the US National Chemistry Olympiad!

M. Barranger-Mathys, J. Houck, *Organizers, Presiding*

8:00 Introductory Remarks.

8:05 1176. The first thirty years of service as the Local Section Coordinator for the National Chemistry Olympiad. **M.M. Kozik**


8:45 1178. Annotating the past USNCO exams – a group volunteering project. **S. Chen**

9:05 Panel Discussion.

9:25 Closing Remarks.

9:30 Break.

11:00 Introductory Remarks.

11:05 1179. International Chemistry Olympiad theoretical tasks: Classroom tools and insights into assessment design. **J.L. Kiappes**

11:25 1180. Mentoring for the USNCO: Commitments and Rewards. **M. Barranger-Mathys**

11:45 Panel Discussion.

12:25 Closing Remarks.
Media in Teaching and Learning Chemistry

W. J. Donovan, Organizer, Presiding

11:00 Introductory Remarks.

11:05 1181. Using the C-SPAN Archives in chemistry classes to build civic understanding and engagement. A. Langrish, W.J. Donovan

11:25 1182. Science Literacy and Real-World Chemistry Content. C. Suh

11:45 1183. Evolving with measurable impact from sage-on-a-stage to guide-on-the-side. B. Meinzer

12:05 1184. PowerPoint Reimagined: Fueling Student Engagement. K.D. Revell

12:25 Closing Remarks.