College Chemistry Canada
44th Annual Conference
May 26th - 28th 2017

"Beyond Diversity: Inclusiveness in Chemistry Education"

Chemistry
UNIVERSITY OF TORONTO

44th College Chemistry Canada Conference Schedule At-A-Glance

Department of Chemistry, University of Toronto

LM = Lash Miller Chemical Laboratories, 80 St. George Street

THURSDAY 25th MAY	FRIDAY 26th MAY	SATURDAY 27th MAY	SUNDAY 28th MAY
5:00-6:00 p.m.: Mill Street Brewery tour (Distillery District) 6:00 p.m.: dinner reservation at Mill Street Brewery	10:30-11:30 a.m.: U of T campus tour (Nona MacDonald Visitors Centre) 1:00-2:00 p.m.: JLABS tour (MaRS building, University Avenue) 3:00-4:00 p.m.: C3 Executive Meeting (LM 108) 4:00-5:00 p.m.: conference registration (LM lobby) 5:00-5:15 p.m.: opening remarks (LM 161) 5:15-6:15 p.m.: plenary speaker: Alison Flynn (LM 161) 6:30-9:00 p.m.: welcome reception (Faculty Club)	8:00-9:00 a.m.: conference registration (LM lobby) 9:00-10:00 a.m.: plenary speaker: Cary Supalo (LM 161) 10:00-10:30 a.m.: coffee (LM lobby) 10:30 a.m.-12:10 p.m.: oral presentations (LM 161) 12:10-1:10 p.m.: lunch (LM Davenport Atrium) 1:10-2:30 p.m.: oral presentations (LM 161) 2:30-3:00 p.m.: coffee (LM lobby) and poster presenters available 3:00-4:20 p.m.: oral presentations (LM 161) 4:20-5:20 p.m.: C3 AGM (LM 161) 6:30-10:00 p.m.: conference banquet (Hart House Music Room)	7:30-8:30 a.m.: fun run/walk (Victoria College) 9:00-10:00 a.m.: plenary speaker: Deborah Herrington (LM 161) 10:00-10:30 a.m.: coffee (LM lobby) 10:30 a.m.-12:10 p.m.: oral presentations (LM 161) 12:10-1:10 p.m.: lunch (LM Davenport Atrium) 1:10-2:10 p.m.: oral presentations (LM 161) 2:10-2:30 p.m.: coffee (LM lobby) 2:30-3:10 p.m.: oral presentations (LM 161) 3:10-3:30 p.m.: conference closing remarks (LM 161)
	Posters available for viewing from 5:00 p.m. Friday until 3:00 p.m. Sunday (LM lobby)		

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Cover photograph: outside the Lash Miller Chemical Laboratories at night, courtesy of Professor David Stone.

Chemistry
UNIVERSITY OF TORONTO

May 26th 2017.

Dear Colleagues,

Welcome to Toronto and to the 44th College Chemistry Canada (C3) Conference! We are excited to host this event in Ontario for the first time since 2009 and for the first time ever at the University of Toronto. We hope that your visit here will be enjoyable, stimulating and thought-provoking.

The overarching theme of the conference is *Beyond Diversity: Inclusiveness in Chemistry Education.* Through three plenary lectures, 23 contributed talks and 16 poster presentations we will explore a range of topics including active teaching strategies in the classroom and laboratory, creating supportive learning environments, and methods to increase student engagement.

In anticipation of their contributions, we extend our appreciation to our three plenary speakers: Alison Flynn (University of Ottawa); Cary Supalo (Education Testing Service, Princeton, NJ) and Deborah Herrington (Grand Valley State University, MI). We also acknowledge our sponsors for their substantial support: the Department of Chemistry and Faculty of Arts & Science at the University of Toronto, the Chemical Institute of Canada Chemistry Education Division, and the CIC Chemical Education Fund (a Canadian registered charity with a mandate to support chemistry related, educational initiatives). In addition, as with all conferences, the success of the 44th C3 conference depends on the efforts of many volunteers. We extend a sincere thank you to the undergraduates, graduate students and research fellow who have generously given their time to make this conference a success. They are Diya Zhu, Caroline Pao, Shawn Postle, Kenneth Tran, Brandon Vollick, Kris Kim, Carine Nemr, Louie Fan, Judy Tsao, Matthew Gradiski, Neena Eappen, Rachel Keunen, Jennifer Faust and Alina Trofimova.

One inspirational aspect of the annual C3 conference is the extremely high level of collegiality amongst its participants. We wholeheartedly hope you enjoy connecting with colleagues from across North America and that you gather new ideas to inform and invigorate your teaching!

Sincerely,

Andy Dicks Kris Quinlan David Stone

2017 C3 Conference Organizing Committee

University of Toronto · Chemistry · 80 St. George Street, Toronto, ONM5S 3H6 · Tel: 416-978-3564 · Fax: 416-978-8775 · www.chem.utoronto.ca

26th May 2017.

Greetings from the President of C3,

It is my great pleasure as C3 President to welcome you all to the 44th Annual C3 Conference, hosted by the University of Toronto from May 26th - May 28th 2017. As C3 members, we are so fortunate to participate in conferences that have their own unique molecular formula of people, ideas, and experiences. This year we happily find ourselves in "T.O." or "Hollywood North", and I'm absolutely confident we are in for a blockbuster conference thanks to the amazing and tireless directing by our wonderful conference organizers.

The 2017 C3 theme: "*Beyond Diversity: Inclusiveness in Chemistry Education*" brings together a fabulous collection of chemistry educators sharing their insights and approaches to engage all learners. As you can see, this conference program features our traditional C3 hits including: great talks, posters, tours, reception, banquet, fun run, and no less than THREE plenary speakers! There is a simple reason for why our organization and these conferences have been so successful into their fourth decade… they gather a caring and unique community with whom to share our knowledge and take our discipline "beyond".

From all the C3 Executives and Directors, we wish you a rewarding and enriching few days together with your colleagues and peers. And hope you all come to recognize, or reaffirm, the inherent value in this extraordinary opportunity to "confer" and gather together in our inclusive and close-knit community.

Cheers,

Bruno Cinel

President C3

44th College Chemistry Canada Conference Schedule (1)

LM = Lash Miller Chemical Laboratories, 80 St. George Street

THURSDAY 25th MAY		
5:00 – 6:00 p.m.	Mill Street Brewery tour	Distillery District, 21 Tank House Lane
6:00 p.m. –	Dinner reservation	Mill Street Brewery

FRIDAY 26th MAY		
10:30 – 11:30 a.m.	University of Toronto campus tour	Nona MacDonald Visitors Centre 25 King's College Circle
1:00 – 2:00 p.m.	JLABS tour	MaRS Discovery District 661 University Avenue
3:00 – 4:00 p.m.	C3 Executive Committee Meeting	LM 108
4:00 – 5:00 p.m.	Conference registration / posters made available for viewing	outside LM 161 / LM lobby
5:00 – 5:15 p.m.	Conference welcome & introductory remarks	LM 161
5:15 – 6:15 p.m.	**Plenary Lecture:** Alison Flynn (University of Ottawa) Title: "*Learning Outcomes Guide Course Choices and Give Insight into Student Learning*"	LM 161
6:30 – 9:00 p.m.	**WELCOME RECEPTION**	University of Toronto Faculty Club 41 Willcocks Street

SATURDAY 27th MAY		
8:00 – 9:00 a.m.	Conference registration	outside LM 161
9:00 – 10:00 a.m.	**Plenary Lecture:** Cary Supalo (Education Testing Service, Princeton, NJ) Title: "*Equity and Inclusion of the Blind in Chemistry and Other Science College Courses*"	LM 161
10:00 – 10:30 a.m.	**COFFEE BREAK**	LM lobby
10:30 a.m. – 12:10 p.m.	**Session 1: *General Chemistry Preparation, Laboratories & Evaluation (Chair: Kathy Darvesh)*** 10:30 – 10:50 a.m.: Bryan Rowsell (Red Deer College, AB) "*Bridging the Gap: Preparing Students for University Courses at Red Deer College*" 10:50 – 11:10 a.m.: Michael Jansen (Crescent School, ON) "*Some Quick and Useful Labs/Demonstrations*" 11:10 – 11:30 a.m.: Mary Sheppard (Saint Mary's University, NS) "*Student Choice of a Traditional vs. Guided Inquiry Buffer Experiment*" 11:30 – 11:50 a.m.: Amanda Musgrove Richer (University of Calgary, AB) "*Group vs. Individual Quizzes in Introductory Chemistry for Engineers*" 11:50 a.m. – 12:10 p.m.: Andrew Vreugdenhil (Trent University, ON) "*A Match Made in Heaven: Integrated Testlets and Multiple Choice Answer Until Correct (AUC) Implementation in First-Year Chemistry*"	LM 161

44th College Chemistry Canada Conference Schedule (2)

LM = Lash Miller Chemical Laboratories, 80 St. George Street

SATURDAY 27th MAY (continued...)		
12:10 – 1:10 p.m.	**LUNCH**	LM Davenport Atrium
1:10 – 2:30 p.m.	**Session 2: *Online Initiatives (Chair: James Bailey)***	LM 161
	1:10 – 1:30 p.m.: Lydia Chen (McMaster University, ON) "*Experience in Online Course Development and Delivery*"	
	1:30 – 1:50 p.m.: Dietmar Kennepohl (Athabasca University, AB) "*Adopting an Open Online Textbook for Introductory Organic Chemistry*"	
	1:50 – 2:10 p.m.: Ernie Prokopchuk (Yukon College, YK) "*DIY Lecture Capture*"	
	2:10 – 2:30 p.m.: Brett McCollum (Mount Royal University, AB) "*Building Relationships through Flipped Instruction and Inter-Institutional Chemistry Communication Practice*"	
2:30 – 3:00 p.m.	**COFFEE BREAK & POSTER PRESENTERS AVAILABLE**	LM lobby
3:00 – 4:20 p.m.	**Session 3: *Organic Chemistry & Molecular Visualization (Chair: Sudhir Abhyankar)***	LM 161
	3:00 – 3:20 p.m.: Derek Jackson (York University, ON) "*Combining Different Learning Initiatives in an Organic Chemistry Class*"	
	3:20 – 3:40 p.m.: Jessie Key (Vancouver Island University, BC) "*Organic Chemistry for the Visually Impaired*"	
	3:40 – 4:00 p.m.: Maryam Abdinejad (University of Toronto, ON) "*Enhanced Student Learning using 3D Visualization*"	
	4:00 – 4:20 p.m.: Shadi Dalili (University of Toronto Scarborough, ON) "*Enhancement of Student Engagement and Learning in Chemistry through Case Study Extra Credit Projects*"	
4:20 – 5:20 p.m.	C3 Annual General Meeting	LM 161
6:30 – 10:00 p.m.	**CONFERENCE BANQUET**	Hart House Music Room 7 Hart House Circle

44th College Chemistry Canada Conference Schedule (3)

LM = Lash Miller Chemical Laboratories, 80 St. George Street

SUNDAY 28th MAY		
7:30 – 8:30 a.m.	**FUN RUN / WALK**	Victoria College, Rowell Jackman Hall 85 Charles Street West
9:00 – 10:00 a.m.	**Plenary Lecture:** Deborah Herrington (Grand Valley State University, MI) Title: "*Helping Students Construct Understanding of Chemistry Concepts with Online Simulations*"	LM 161
10:00 – 10:30 a.m.	**COFFEE BREAK**	LM lobby
10:30 a.m. – 12:10 p.m.	**Session 4: *General Chemistry Lectures & Teaching Tips (Chair: Jimmy Lowe)***	LM 161
	10:30 – 10:50 a.m.: Sudhir Abhyankar (Memorial University, Grenfell Campus, NL) "*Taking Ownership of Learning: Increasing Student Involvement in General Chemistry Problem-Solving*"	
	10:50 – 11:10 a.m.: Nirusha Thavarajah (University of Toronto Scarborough, ON) "*Peer-Facilitated Learning in a Large General Chemistry Classroom*"	
	11:10 – 11:30 a.m.: Ozcan Gulacar (University of California-Davis, CA) "*Reading Students' Minds: Finding Out What is Not Sticking*"	
	11:30 – 11:50 a.m.: Hovig Kouyoumdjian (York University, ON) "*Unpacking Student Explanations of Acid-Base Reactions*"	
	11:50 a.m. – 12:10 p.m.: Kathy Darvesh (Mount Saint Vincent University, NS) "*Lessons from the Book Club*"	
12:10 – 1:10 p.m.	**LUNCH**	LM Davenport Atrium
1:10 – 2:10 p.m.	**Session 5: *Teaching Effective Chemistry Writing (Chair: Mary Sheppard)***	LM 161
	1:10 – 1:30 p.m.: Nicole Sandblom (University of Calgary, AB) "*Teaching Scientific Writing to Chemistry Students using a Flipped Classroom with a Team-Based Learning Approach*"	
	1:30 – 1:50 p.m.: Carl Doige (Okanagan College, BC) "*Mini-Formal Approach to Report Writing: Focused Support and Scaffolding for the Writing Process*"	
	1:50 – 2:10 p.m.: Jimmy Lowe & Rosamaria Fong (British Columbia Institute of Technology, BC) "*From Laboratory to Video to Paper: Helping Students to Improve Laboratory Report Writing*"	
2:10 – 2:30 p.m.	**COFFEE BREAK**	LM lobby

44th College Chemistry Canada Conference Schedule (4)

LM = Lash Miller Chemical Laboratories, 80 St. George Street

SUNDAY 28th MAY (continued...)		
2:30 – 3:10 p.m.	**Session 6: *Communicating Chemistry (Chair: Bruno Cinel)***	LM 161
	2:30 – 2:50 p.m.: Brett McCollum (Mount Royal University, AB) "*Connecting Academic Communities through the Scholarship of Teaching and Learning*"	
	2:50 – 3:10 p.m.: Yann Brouillette (Dawson College, QC) "*Comic Book Chemistry Part Seven: Wet Pen of Masked Reactions*"	
3:10 – 3:30 p.m.	Conference closing remarks	LM 161

POSTER PRESENTATIONS (poster viewing from 5:00 p.m. Friday until 3:00 p.m. Sunday, LM lobby. Presenters available 2:30 – 3:00 p.m. Saturday)

1. Kelly Resmer (Mount Saint Vincent University, NS): "*Collaborating Online Made Easy With Slack*"
2. Matt Zamora (Nanalysis Corporation, AB): "*Revolutionizing Undergraduate Laboratories with Benchtop NMR: An Active Learning Approach*"
3. Alina Trofimova (University of Toronto, ON): "*Computational Experiment in CHM 151Y: "The Molecular Science" Course*"
4. John Lee (Camosun College, BC): "*Don't Spare Me the Graphic Details!*"
5. Kristine Quinlan (University of Toronto, ON): "*CHM 135H Laboratory Renewal*"
6. Francois Gauvin (Université de Saint-Boniface, MB): ""*How Do I Start?" - A Proposal to Help Solving First-Year Quantitative Problems*"
7. Kris Kim (University of Toronto, ON): "*The Chemistry Teaching Fellowship Program at the University of Toronto*"
8. Louie Fan (University of Toronto, ON): "*A Fresh Perspective: Designing a Laboratory Manual to Engage and Prepare Students*"
9. Shadi Dalili (University of Toronto Scarborough, ON): "*Comparison of Traditional Organic Chemistry Textbooks with a Digital, Interactive Textbook in Introductory Organic Chemistry*"
10. Alexander Waked (University of Toronto, ON): "*The Green Chemistry Initiative at the University of Toronto*"
11. Hossain Samar Qorbani (University of Toronto, ON): "*Use of Augmented/Virtual Reality (AR/VR) in Education*"
12. Kenneth Tran (University of Toronto, ON): "*Developing Organic Laboratory Technique Videos*"
13. Jennifer Faust (University of Toronto, ON): "*Environmental Chemistry Beyond the Classroom: A Semester-Long Industrial Consulting Project*"
14. Shawn Postle (University of Toronto, ON): "*Demonstrating Green Chemistry Concepts Through Alkene Reactivity*"
15. Elizabeth Gillis (University of British Columbia, BC): "*Short-term Student-directed Research as a Vehicle for Learning the How and Why of Scientific Communication*"
16. Elizabeth Gillis (University of British Columbia, BC): "*Communicating Chemistry: Targeting Communication Skills in the Undergraduate Classroom*"

44th College Chemistry Canada Conference Sponsorship

We are very grateful for support from the following sponsors:

Chemistry
UNIVERSITY OF TORONTO

UNIVERSITY OF TORONTO
FACULTY OF ARTS & SCIENCE

the CIC / **Chemical Education Fund**

the CIC / **Chemistry Education Division**

The 45th College Chemistry Canada (C3) Conference

will be proudly hosted by the

Chemical Technology Program
NAIT
Edmonton, Alberta

Thursday May 24 – Saturday May 26, 2018

(Immediately prior to the 101st Canadian Chemistry Conference & Exhibition in Edmonton: Sunday May 27 – Thursday May 31)

Organizing Committee Co-Chairs:
Paula Hawrysz (phawrysz@nait.ca)
Laura Lucan (laurentl@nait.ca)

collegechemistrycanada.ca nait.ca/chemtech

2017 C3 Student Scholarship Recipients

The College Chemistry Canada executive committee is very pleased to announce the recipients of the 2017 C3 Host College Student Scholarship and the 2017 C3 General Student Scholarship. They are **Maxwell Olson** and **Mark Croxall** respectively, who are both studying at the University of Toronto.

2017 C3 Host College Student Scholarship

The C3 Host Student Scholarship is designed to help a student pursue studies at a Canadian college or university in science, and to raise the profile of College Chemistry Canada. To reflect the diversity of programmes and objectives of colleges in Canada, the criteria for awarding is left to the institution which hosts the annual C3 conference. Maxwell (Max) Olson has just completed his third year of undergraduate studies in the Synthetic & Catalytic Chemistry specialist program at U of T. His talent for the subject has led to several research positions within the department. When he is not studying chemistry, he often relaxes by playing the piano. Max also enjoys spending time outdoors by skiing in the winter and canoeing in Algonquin Park during the summer. He has a passion for food and cooking and takes an enthusiastic interest in history, classical music and the aerospace industry.

2017 C3 General Student Scholarship

The C3 General Student Scholarship is designed to help a student pursue studies at a Canadian college or university (or other post-secondary educational institution) in science, and to raise the profile of College Chemistry Canada. Mark Croxall will begin graduate school at U of T after completing a Chemistry specialist program in the department. He has demonstrated significant academic improvement over the course of his degree, and has been an active volunteer mentor to first-year undergraduates as well as an outreach participant with high school students. Outside of chemistry, Mark enjoys playing a variety of sports including hockey and soccer. He enjoys spending time at the cottage with his family and is an avid video game player as a diversion from studying.

Plenary Lecture 1

Friday 26th May: 5:15 – 6:15 p.m., room LM 161

Professor Alison Flynn: University of Ottawa

"Learning Outcomes Guide Course Choices and Give Insight into Student Learning"

Abstract

Learning outcomes describe the measurable knowledge, skills, and attitudes that students will ideally achieve by the time they have completed a given degree, program, course, or section/module. In our work, we have studied student learning and leveraged existing literature to design learning outcomes for chemistry courses and programs. These learning outcomes drive course choices, including the structure, pedagogy, learning activities, and assessments. We can use rich assessment methods and the learning outcomes to uncover students' knowledge and skills, including identifying gaps and ways that students have connected their knowledge. In this presentation, I will present our work and invite attendees to review and revise one of their own courses to enhance students' learning.

Plenary Lecture 2

Saturday 27th May: 9:00 – 10:00 a.m., room LM 161

Dr. Cary Supalo: Education Testing Services, Princeton, NJ

"Equity and Inclusion of the Blind in Chemistry and Other Science College Courses"

Abstract

This presentation will discuss philosophical and technological solutions for promoting the full inclusion of the blind in STEM classes. Multi-sensory approaches to communicating science content are important to produce more equitable learning experiences for all learners. These solutions are a combination of both low and high tech solutions to provide more hands-on learning experiences for all learners. How persons with visual impairments can be fully integrated into the STEM workforce will be discussed. How a set of fundamental problem solving skills used by the disabled to overcome physical limitations can enhance a skillset as a STEM professional will be illustrated. Twenty-first century skills are a driving force in the removal of access barriers to chemistry and other science professions for the blind and otherwise print disabled, leading the path to equity and inclusion.

Plenary Lecture 3

Sunday 28th May: 9:00 – 10:00 a.m., room LM 161

Professor Deborah Herrington: Grand Valley State University, MI

"Helping Students Construct Understanding of Chemistry Concepts with Online Simulations"

Abstract

Teaching chemistry through online, flipped, or blended classes requires the incorporation of activities that allow students to explore new concepts independently. Technology is frequently leveraged to meet this need through the use of computer simulations as they promote active engagement by allowing students to manipulate variables and observe the outcomes. In chemistry, these simulations can also help students to make connections between the behaviour of particles (something students cannot physically observe) and macroscopic observations or the symbolic level used to convey chemical meaning. Although classroom use of such simulations has been shown to improve student understanding, students using these materials independently may be unable to identify the relevant details of the simulation, or they may develop misconceptions from simulation use in the absence of instruction. This talk will highlight research that examines students' use of simulations and screencasts (videos which point out the salient features of a simulation) in promoting student learning of key chemistry concepts, and provide research-based suggestions for designing assignments, assessments, and screencasts to best support student learning from simulations outside of a structured classroom environment.

Contributed Oral Presentations

Saturday 27th May

Session 1: General Chemistry Preparation, Laboratories & Evaluation

Chair: Kathy Darvesh, Mount Saint Vincent University, NS

1. 10:30 – 10:50 a.m.: Bryan Rowsell* (Red Deer College, AB) and Brian Johnson
"*Bridging the Gap: Preparing Students for University Courses at Red Deer College*"

Abstract: This will be a condensed version of a session given at the Central Alberta Teacher's Convention about helping students make the transition from high school to university-level courses at Red Deer College. Data will be presented about student perceptions about the transition and expectations as well as suggestions for improvement from a local high-school teacher who re-took some first-year courses.

Session 1: General Chemistry Preparation, Laboratories & Evaluation

2. 10:50 – 11:10 a.m.: Michael Jansen (Crescent School, ON)
"*Some Quick and Useful Labs/Demonstrations*"

Abstract: A few really good experiments/demonstrations that have been developed at Crescent School will be presented: A quick determination of molar volume of O_2 at ca. SATP that uses store-bought supplies; three kinetics experiments: the zero order reaction of the burning of a candle, with a fabulous addition; a first order reaction employing a spectrophotometer, using store-bought items; and a second order reaction, done as a "dry" lab—with a useful data analysis technique. Folks, you're gonna love this!

Session 1: General Chemistry Preparation, Laboratories & Evaluation

3. 11:10 – 11:30 a.m.: Mary Sheppard (Saint Mary's University, NS)
"*Student Choice of a Traditional vs. Guided Inquiry Buffer Experiment*"

Abstract: Students in first year chemistry were given a choice between a traditional buffer experiment with a full procedure or a guided inquiry buffer experiment with minimal detail. Pre-laboratory student surveys are analyzed to investigate the relationship between the affective domain and the students' experiment choice and approach to learning. Cognitive learning between the two groups is compared based on laboratory report and laboratory quiz grades.

Session 1: General Chemistry Preparation, Laboratories & Evaluation

4. 11:30 – 11:50 a.m.: Amanda Musgrove Richer* (University of Calgary, AB) and Linh Ly "*Group vs. Individual Quizzes in Introductory Chemistry for Engineers*"

Abstract: The tutorial component of CHEM 209 (an introductory chemistry course for engineers) was historically a chance to ask questions of your TA then write a weekly quiz. Over the past two years, we have introduced elements of group work into the tutorials in order to try to make better use of the time and reduce the stress on students from doing graded quizzes every week. This talk will outline the successes and challenges we found in switching to a more collaborative work model - including changes in student attitude towards tutorial and shifts in the curricular material in tutorial and exam preparation for the students.

Session 1: General Chemistry Preparation, Laboratories & Evaluation

5. 11:50 a.m. – 12:10 p.m.: Andrew Vreugdenhil* (Trent University, ON) and Aaron Slepkov

"*A Match Made in Heaven: Integrated Testlets and Multiple Choice Answer Until Correct (AUC) Implementation in First-Year Chemistry*"

Abstract: The value of rapid feedback to students and the reality of large class sizes at post-secondary institutions often means that introductory chemistry courses utilize multiple choice questions for a significant fraction of their student assessments in a testing environment. By their nature, single answer multiple choice questions are limited in their sophistication and conceptual depth. As a result, tests are often not the best representation of the types of questions used in assignments, labs and classes. Integrated Testlets coupled with an Answer Until Correct multiple choice tool have permitted us to trial a testing approach which provides instructors with an evaluation technique aimed at addressing these limitations while providing students with rapid feedback that permits learning to happen in a testing environment.

Session 2: Online Initiatives

Chair: James Bailey, University of British Columbia Okanagan, BC

6. 1:10 – 1:30 p.m.: Lydia Chen (McMaster University, ON)
"*Experience in Online Course Development and Delivery*"

Abstract: The rapid evolution of technology creates a wave of changes to the landscape of online teaching. How do we design an online course with clearly defined objectives and appropriate assessment tools while providing support to enhance student success in an online environment? I will discuss my experience to create and to deliver my first online course, "Chemistry in Everyday Life". In this presentation, I will explain the challenges I face in an online course more fully and explore possible alternatives.

Session 2: Online Initiatives

7. 1:30 – 1:50 p.m.: Dietmar Kennepohl (Athabasca University, AB)
"*Adopting an Open Online Textbook for Introductory Organic Chemistry*"

Abstract: The aspiration to "science for all," with its goal of universal and open access to science has really benefited from distance education and new technologies. Of particular interest is the whole movement around open educational resources (OERs), which has presented us with a new inclusive way of doing things that should realize savings and increase access. This past year we have replaced the commercial textbook for our introductory organic chemistry courses (CHEM 350/360) with access to chemistry LibreTexts (formerly ChemWiki) at UC Davis. It is an open-access environment where both students and faculty write and rewrite content to result in a customizable no-fee, high-quality textbook, accessible anytime, anywhere, by anyone through the internet. The presentation describes our experience in developing a custom textbook and integrating it into our online courses.

Session 2: Online Initiatives

8. 1:50 – 2:10 p.m.: Ernie Prokopchuk (Yukon College, YK)
"*DIY Lecture Capture*"

Abstract: Lecture capture (recording class proceedings to post online) does not need to involve expensive specialized equipment and software. With the goal of providing students multiple ways to access and review class content I have been experimenting with DIY (Do It Yourself) lecture capture in my classes using common off-the-shelf electronics and inexpensive/free software. Without a large financial investment, videos can be produced in both a "picture-in-picture" style as well as a simpler screen-recording style. This presentation will describe the equipment, software, and workflow involved with making these videos as well as highlight some of the advantages and disadvantages of these methods.

Session 2: Online Initiatives

9. 2:10 – 2:30 p.m.: Brett McCollum* (Mount Royal University, AB), Layne Morsch, Cameron Egler, Cassidy Fleming, Kara Plotnikoff, Darlene Skagen and Brandon Shokoples

"*Building Relationships through Flipped Instruction and Inter-Institutional Chemistry Communication Practice*"

Abstract: Class ends, and immediately after your students put their notebooks away they put on their headphones. In one study, 87% of learners reported self-imposed isolation through the use of headphones to avoid talking to others (Lever, 2007). One of the benefits of a physical campus is the opportunity for social interactions, as compared to the challenges faced by distance-based learners (Haythornthwaite et al., 2000). Faculty can facilitate the development of relationships within the chemistry classroom (McCollum, 2016). Flipped classroom instruction with academic reading circles (ARCs) and open-response multiple-attempt (ORMA) group quizzes have successfully promoted peer-peer relationships in general, organic, and advanced chemistry courses. Furthermore, the benefits of relationship development were reported by students engaged in inter-institutional chemistry communication practice. These learners, second-year organic chemistry students at two universities, completed a series of collaborative homework assignments online over Skype. In this session, we will present a collection of evidence-based practices for fostering stronger relationships to enhance student learning.

Lever, K. M. Ph.D. thesis, graduate school: New Brunswick Rutgers, NJ, 2007. Retrieved from http://dx.doi.org/doi:10.7282/T3P84C95.

Haythornthwaite, C. et al. (2000). *Journal of Computer-Mediated Communication*, 6(1).

McCollum, B. (2017). Improving Academic Reading Habits in Chemistry through Flipping with an Open Education Digital Textbook. In *Technology and Assessment Strategies for Improving Student Learning in Chemistry*; Schultz, M., Schmid, S., Holme, T. Eds.; American Chemical Society Symposium Series; ACS: Washington, DC.

Session 3: Organic Chemistry & Molecular Visualization

Chair: Sudhir Abhyankar, Memorial University, Grenfell Campus, NL

10. 3:00 – 3:20 p.m.: Derek Jackson* (York University, ON) and Hovig Kouyoumdjian
"*Combining Different Learning Initiatives in an Organic Chemistry Class*"

Abstract: Introductory organic chemistry is a pivotal course in science and pre-professional curricula in Canadian universities. Unfortunately, students often enter with preconceived notions relating to the difficulty of the course material, which often impacts enrollment numbers and their overall university experience in a potentially negative way. Second year organic chemistry at York University is a large course (500 students); thus keeping students motivated and engaged is a challenging task. During the past academic year, we utilized an active learning approach wherein we encouraged elements of peer instruction through the use of clickers and we utilized a new wireless teaching technology which allows for more effective note-taking and learning. Moreover, several online components such as quizzes, problem sets and interactive tutorials allowed for continuous feedback throughout the term. Additionally, flipped lecture recordings augmented the in-class experience by allowing more time to be budgeted for developing scientific practices and solving more advanced problems collaboratively. Overall, students showed significant improvement in their academic performance compared to previous cohorts. Further results from this work will be presented.

Session 3: Organic Chemistry & Molecular Visualization

11. 3:20 – 3:40 p.m.: Jessie Key (Vancouver Island University, BC)
"*Organic Chemistry for the Visually Impaired*"

Abstract: Including and supporting students with disabilities remains a priority at Vancouver Island University. Herein, I will discuss the support strategy undertaken for a student with complete visual impairment who achieved success in our general and organic chemistry courses.

Session 3: Organic Chemistry & Molecular Visualization

12. 3:40 – 4:00 p.m.: Maryam Abdinejad* (University of Toronto, ON), Hossain Samar Qorbani and Lana Mikhaylichenko
"*Enhanced Student Learning using 3D Visualization*"

Abstract: Rapid development of computing technology has revolutionized every area of our lives, including education. As a result, many delivery opportunities now exist to enhance student learning and information transfer. In particular, animations have added a fresh perspective to the teaching repertoire. Computer animations represent an aesthetically pleasing approach to learning when compared to text and diagrams. Many students have difficulty learning symbolic and molecular presentations of chemistry. Using animations can increase student interest and motivation while illustrating concepts that may be difficult to explain using traditional methods. Furthermore, digital animations provide another modality to actively engage the learner. We believe a computer-based visualisation tool with 3D models will improve students' ability to improve their understanding of different molecular structure. In addition, digital learning can be economical, as it does not require expensive instrumentations. In the current research, we will also perform the design and development of a 3D augmented reality tool, called ARchemy. This tool will help students understand chemical interactions by using tactile AR markers to simulate molecular bonds in a 3D digital environment.

Session 3: Organic Chemistry & Molecular Visualization

13. 4:00 – 4:20 p.m.: Shadi Dalili* (University of Toronto Scarborough, ON) and Farkhondeh Fathi

"*Enhancement of Student Engagement and Learning in Chemistry through Case Study Extra Credit Projects*"

Abstract: One of the biggest challenges in science education at the university level is creating interest and motivation in students towards the subject matter, particularly in chemistry. In this study, we have applied a novel experiential learning method to encourage students to go beyond the theoretical aspect of chemistry concepts taught, and to find applications of learned concepts in their everyday lives. They have been given the freedom to select any topic within the course outline to creatively present the materials which they learned in the form of a story or "case study". Through this methodology, they engage with their instructors beyond classroom time and learn to connect learned concepts to real-life applications. The students have been selected from two, second year chemistry courses, Analytical Chemistry at Mount Allison University, and Organic Chemistry from the University of Toronto Scarborough. The results not only show enhanced level of student engagement, increased interest in the subject matter, and in-depth learning, but also demonstrate how crafting an extra credit project in the form of case studies has alleviated the fear of students approaching their professors for help. Survey data collected shows that an overwhelming majority of students expressed extremely strong interest in this new pedagogical approach.

Contributed Oral Presentations

Sunday 28th May

Session 4: General Chemistry Lectures & Teaching Tips

Chair: Jimmy Lowe, British Columbia Institute of Technology, BC

14. 10:30 – 10:50 a.m.: Sudhir Abhyankar (Memorial University, Grenfell Campus, NL)
"*Taking Ownership of Learning: Increasing Student Involvement in General Chemistry Problem-Solving*"

Abstract: Most questions and problems that students encounter in first year general chemistry courses are already made-up by instructors or textbook authors. There are, however, a number of situations in the classroom where students can provide direct input in making and solving the problem in real-time. A few examples of these opportunities will be provided in this presentation and some of the benefits to the students will also be discussed.

Session 4: General Chemistry Lectures & Teaching Tips

15. 10:50 – 11:10 a.m.: Nirusha Thavarajah (University of Toronto Scarborough, ON)
"*Peer-Facilitated Learning in a Large General Chemistry Classroom*"

Abstract: Engaging students in cognitive processing activities such as in-class problem solving enhance learning compared to lecturing (Mayer et al., 2009). A recent study by Freeman et al. (2014) confirms that active learning interventions have significantly improved student learning and that students in passive lecture courses are one and a half times more likely to fail than the students engaged in active learning environments. Peer-facilitated learning is an active teaching method which has been shown to be more effective in student learning (Prince, 2004). This presentation will discuss some preliminary qualitative and quantitative data collected on the impact of implementing peer-facilitated learning in a large general chemistry classroom.

Mayer, R. E. et al. (2009). *Contemporary Educational Psychology* 34(1), 51–57.

Freeman, S. et al. (2014). *Proceeding of the National Academy of Sciences of the United States of America* 111, 8410–8415.

Prince, M. (2004). *Journal of Engineering Education* 93(3), 223–231.

Session 4: General Chemistry Lectures & Teaching Tips

16. 11:10 – 11:30 a.m.: Ozcan Gulacar* (University of California-Davis, CA), Jennifer Kopetzky, Kyleigh Jacobs, Spivey McLane and Alexandra Milkey
"*Reading Students' Minds: Finding Out What is Not Sticking*"

Abstract: Experts' knowledge structures and ability to effectively solve problems highlight that meaningful and productive learning does not occur unless knowledge is organized around fundamental principles. Obtaining such a knowledge structure is not an easy job since a learner is required to metacognitively monitor his or her learning and to continuously revise the interaction between existing and new knowledge pieces. These skills are important because the nature of these structures is among the most important predictors of one's success in solving scientific and everyday problems. To study these structures, three cumulative word association tests were developed by selecting major general concepts as stimulus words. The tests were administered over three-quarters during the academic year of 2015-2016 in an undergraduate general chemistry class. For each word, students were asked to provide five response words that came to mind within forty-five seconds of reading each stimulus word. After coding and determining the frequency of each response, the top twenty-five responses for each stimulus word were used to calculate relatedness coefficients, which are measures of how closely stimulus words are linked in the students' minds. In the final stage, network generating programs were utilized to interpret these relatedness coefficients and determine knowledge structures, respectively.

Session 4: General Chemistry Lectures & Teaching Tips

17. 11:30 – 11:50 a.m.: Hovig Kouyoumdjian* (York University, ON), Sonia Underwood and Melanie Cooper

"*Unpacking Student Explanations of Acid-Base Reactions*"

Abstract: Acid-base chemistry is one of the most versatile ways to understand a wide range of chemical reactions. Students are typically taught several models of acid base chemistry that emphasize different aspects. In this talk, we present a method that characterizes how students' reason about acid-base reactions specifically in response to prompts asking what, how, and why these reactions occur. We categorized students' reasoning into different reasoning categories. We find that by carefully structuring the prompt we are able to elicit different types of explanations and that there is a positive correlation between the level of sophistication of the student explanations and their corresponding mechanistic arrow drawings.

Session 4: General Chemistry Lectures & Teaching Tips

18. 11:50 a.m. – 12:10 p.m.: Kathy Darvesh (Mount Saint Vincent University, NS)
"*Lessons from the Book Club*"

Abstract: This year, the MSVU Teaching and Learning Centre organized a Book Club called "Talk about Books". There were several breakfast meetings during the term where faculty members from various departments met to discuss books related to teaching. I was pleased to learn about several teaching tips that looked easy to implement without having to do a major course overhaul. I will share one or two of these teaching tips, and describe how I used them in my General Chemistry and Inorganic Chemistry courses.

Session 5: Teaching Effective Chemistry Writing

Chair: Mary Sheppard, Saint Mary's University, NS

19. 1:10 – 1:30 p.m.: Nicole Sandblom* (University of Calgary, AB), Heather Addy, Wendy Benoit and Éowyn Campbell
"*Teaching Scientific Writing to Chemistry Students using a Flipped Classroom with a Team-Based Learning Approach*"

Abstract: "Writing and Reviewing Scientific Reports" is the scientific writing course offered by the Faculty of Science at the University of Calgary. Chemistry majors and most geoscience majors require this course. The overarching goal is to help students develop writing strategies that will be useful throughout a career in science. Our teaching development team for this course moved to a Team Based Learning (TBL) approach between the Fall 2014 and Winter 2015 semesters. In the TBL approach, the course is divided into several topics. For each topic, students read materials online then write a quiz first as an individual and then as part of a team. Teams complete in-class activities to emphasize key points from the readings and from the course objectives. Individuals work on two major papers; we provide guidance in developing the first topic and then students self-select a second topic. We can now provide more opportunities for students to work on their own writing during class time and to receive prompt feedback. This method produced highly engaged students who improved in their writing much earlier in the semester, also enhancing instructor experiences in the course.

Session 5: Teaching Effective Chemistry Writing

20. 1:30 – 1:50 p.m.: Carl Doige* (Okanagan College, BC) and Jasmine Korcok
"*Mini-Formal Approach to Report Writing: Focused Support and Scaffolding for the Writing Process*"

Abstract: An important aspect of the undergraduate chemistry laboratory experience involves formal report writing. Such reports require students to demonstrate clear articulate prose, critical analysis of the experimental content but also the unique conventions of scientific presentation of tables and figures. At our institution, given the number of students in each lab section and the corresponding grading load, students are only required to write one formal report per semester. For most labs, therefore, students complete short-answer worksheets. While students are provided with formal lab report guidelines and a sample report, the quality of the formal reports tend to be poor and is a source of frustration for both the students and lab instructors. With the goal to provide more feedback and scaffolding for our students, we have initiated a novel approach to the formal report writing where students write four mini-formals over the course of one semester. Each mini-formal addresses only one aspect of a complete formal. In this presentation, I will describe the logistics of adapting a typical experiment sequence to the mini-formal report process. I will also provide evidence of how the limited focus per report offers more opportunity for direct instruction and support for students. Finally, I will highlight student response to this approach.

Session 5: Teaching Effective Chemistry Writing

21. 1:50 – 2:10 p.m.: Jimmy Lowe* & Rosamaria Fong* (British Columbia Institute of Technology, BC), Bob Bower, Matthew Fong, Gregor Miller and Sidney Fels
"*From Laboratory to Video to Paper: Helping Students to Improve Laboratory Report Writing*"

Abstract: CHEM 0011 is an equivalent course to BC high school grade 11 Chemistry offered in the BCIT Technology Entry (TE) Program. The TE students range in age from 17 to 59, and many of them have little or no experience with chemistry and writing lab reports. A set of videos was made to help the students to preview and review lab skills. Another set of videos was made for each experiment to review concepts, observations, and provide guidance for writing lab reports. TE students could use *ViDeX,* a video player application developed at UBC. This application provided them with features such as (i) video search via transcripts and visuals, (ii) video and text highlighting, and (iii) frequency of viewing. Data gathered from *ViDeX* can provide information on the students' habits, involvement, and behaviour when viewing the instructional videos. For the format of the lab report writing instructional videos, preliminary results appear to indicate that students watched the videos non-linearly, skipped around the video timeline to search for specific contents that are needed. Outcomes of the students' viewing habits will help to improve the videos for future students. An overview of the project and initial results to date will be presented.

Session 6: Communicating Chemistry

Chair: Bruno Cinel, Thompson Rivers University, BC

22. 2:30 – 2:50 p.m.: Brett McCollum (Mount Royal University, AB)
"*Connecting Academic Communities through the Scholarship of Teaching and Learning*"

Abstract: Chemistry educators have long been engaged in systemic inquiry into effective teaching and learning practices. Journals dedicated to chemistry education, and more broadly STEM education, bring together chemistry education researchers and practitioners. For approximately two decades, disciplinary scholars from diverse fields such as chemistry, sociology, business, and nursing, have connected their academic communities to share research expertise in teaching and learning that crosses disciplinary boundaries. As with Chemistry Education Research, the Scholarship of Teaching and Learning (SoTL) goes beyond casual observations about student learning or teaching practice. SoTL scholars systematically collect and explore evidence, construct models for teaching and learning, and communicate those results in peer-reviewed venues. The SoTL movement is growing in Canada through academic journals such as Teaching and Learning Inquiry and The Canadian Journal for Scholarship of Teaching and Learning, the SoTL Canada organization, and a growing number of institutes and centres at Canadian universities and colleges. The Institute for Scholarship of Teaching and Learning at Mount Royal University has served as a model for many of these centres. Over the past nine years, approximately 20% of full-time faculty at MRU have participated in a multiyear intensive SoTL training program. The Institute also provides research funding for SoTL projects and hosts the annual Symposium on SoTL. In October 2017, the Institute will co-host the International Society for SoTL. In this session, I will compare the practices of Chemistry Education Researchers with SoTL scholars, and explore how chemistry educators and the SoTL community can benefit from each other.

Session 6: Communicating Chemistry

23. 2:50 – 3:10 p.m.: Yann Brouillette (Dawson College, QC)
"*Comic Book Chemistry Part Seven: Wet Pen of Masked Reactions*"

Abstract: The pen is mightier than the sword, but chemical reactions are two-edged swords, so let's use Photoshop to peacefully distill some chemistry from sequential art. Taking a glance at the chemical foundation for superhero aptitude under an atomic-force microscope, dissection of some factual diamonds from a world flooding with science in fiction will be attempted. This talk continues previous years' presentations about the "Chemistry of Superheroes", focusing this time on the hidden gems of chemistry in mainstream comics. Chemical evidence will be used to analyse certain super powers, innovative armours and marvellous abilities described in comic book universes. A fun and critical look at rational explanations describing out-of-the-ordinary events impersonated by characters seen in movies, TV shows and graphic novels will be investigated. From the Smurfs' blue skin and Iron Man's plasma to the Invisible Woman's force fields, crucial chemical facts can be extracted from uncanny tales. As a result, by discerning magic from scientific, a comic book fan can enjoy a chemical alter-ego.

Poster Presentations (1)

Posters available for viewing from 5:00 p.m. Friday until 3:00 p.m. Sunday, Chemistry Department lobby

1. Kelly Resmer (Mount Saint Vincent University, NS)
"*Collaborating Online Made Easy With Slack*"

Abstract: The use of Slack, a cloud-based software program for collaboration, will be presented. Slack is a tool that makes sharing ideas, files, etc. very easy! It is free, searchable, customizable, very mobile- friendly and integrates with tools such as Google Drive and Dropbox. I will describe how Slack was used to supervise a high school science co-op student completely online. I will also demonstrate how it can be used to help facilitate and organize online discussions to help build and foster a community of learners online.

2. Matt Zamora* (Nanalysis Corporation, AB), Juan Araneda and Susanne Riegel
"*Revolutionizing Undergraduate Laboratories with Benchtop NMR: An Active Learning Approach*"

Abstract: Educational curricula trends are shifting towards hands-on, guided-inquiry approaches that help students obtain meaningful learning. Even though nuclear magnetic resonance (NMR) is the most commonly used characterization technique in inorganic and organic chemistry, it is usually the least available to college students. Since the biggest restriction to including NMR spectroscopy in laboratories is the limited accessibility of high-field NMR, benchtop NMR provides an easy solution. In addition to the manufacturing of benchtop systems, Nanalysis has continued to develop innovative and creative experiments to teach students the applications of NMR spectroscopy outside of ordinary "characterization-only" analyses, while implementing more hands-on pedagogical strategies made possible with benchtop. Students can operate a real spectrometer instead of simply looking at printed spectra. Within a laboratory context, simply handing out pre-printed spectra of model compounds does little to remove the mystery associated with NMR spectroscopy. As access to an NMR spectrometer has previously been the limiting factor, strategies have focused on increasing the accessibility and acquisition of raw data. This poster will focus on outlining how organic experiments, both classic and contemporary, can be revolutionized with student-access to benchtop NMR spectroscopy.

Poster Presentations (2)

3. Alina Trofimova* (University of Toronto, ON) and Barbora Morra
"*Computational Experiment in CHM 151Y: "The Molecular Science" Course*"

Abstract: During CHM 151Y: "The Molecular Science" course, first-year students are introduced to computational chemistry during one of the laboratory sessions. Students build molecules and obtain data using the WebMO program. Previously all students explored the same molecule: methylcyclohexane. In this research we modified the experiment to improve students' experience and encourage them to work together, by introducing a variety of different cyclohexane substituents. At the beginning of the experiment each student takes a card with a unique substituent, rather than just the methyl group. An instructor then collects the obtained results and provides a "summary" table to the whole class. Thus, the work of each student contributes to the whole experiment. Division of labour helps students to improve their ability to analyze group results and make an overall conclusion.

4. John Lee* (Camosun College, BC), Dayna Clarke and Ivy Deavy
"*Don't Spare Me the Graphic Details!*" *(a simple approach to removing the major barriers to effective student performance in the laboratory)*

Abstract: Camosun enjoys a diverse community of learners, both international and domestic. The requirements for formulaic and time consuming lab reports, as well as difficulty in understanding written instructions for lab procedures, have been reported as being the major barriers to success, enjoyment and deeper learning of Chemistry. This poster outlines an approach taken by the Instructor as part of a wider College initiative: Universal Design, to address these impediments to student success.

Poster Presentations (3)

5. Kristine Quinlan* (University of Toronto, ON), Labib Chowdhury, Bessie Xue, Bianca Bird and Jessica D'eon
"*CHM 135H Laboratory Renewal*"

Abstract: The University of Toronto runs a Research Opportunities Program (ROP) that allows undergraduates who have completed their first year to work with faculty members on a research project. In the summer of 2016, a team of two faculty members and three ROP students worked to develop new experiments for CHM 135H, a general chemistry course for first-year life science students. The goal of the project was three-fold: (i) to correct a mismatch between lecture and laboratory material; (ii) to incorporate green chemistry and climate change into the CHM 135H curriculum in a meaningful way; and (iii) to provide students with a relaxed, engaging introductory experiment to help them see science as fun and exciting. To that end, the team developed two new experiments: "Gas Stoichiometry" (run Summer 2016, Fall 2016 and Winter 2017) and "Phase Changes and the Greenhouse Effect" (run Fall 2016 and Winter 2017). These experiments have had a large impact on undergraduates already and feedback from both laboratory demonstrators and students has been extremely positive.

6. François Gauvin (Université de Saint-Boniface, MB)
""*How Do I Start?" - A Proposal to Help Solving First-Year Quantitative Problems*"

Abstract: When it comes to solving stoichiometry, thermochemistry, thermodynamics, kinetics, or equilibrium quantitative problems, first-year students often wonder how they should initially approach them. Given that students frequently lack self-confidence with respect to these topics (and to algebra and other mathematics skills as well), they often ask us for simple guidelines to follow first. Problem-solving requires good mastery of Bloom's taxonomy levels of knowledge, primarily the 4th one, i.e. the capacity of "ANALYZING" a problem. Yet, no one can analyze a problem without "APPLYING" knowledge (3rd level) which comes with good "UNDERSTANDING" of the situation (2nd level). All this would not be possible without "REMEMBERING" a minimum number of fundamental chemical concepts and laws (1st level). This poster will propose some types of checklists (under the form of cards) that can be used by students to help them structure their mind in order to solve quantitative chemistry problems. Several examples of problems will be shown to illustrate the use of this tool. Comments and suggestions from the conference participants will be welcome for discussion.

Poster Presentations (4)

7. Kris Kim* (University of Toronto, ON), Darius Rackus, Scott Mabury, Barbora Morra and Andrew Dicks

"*The Chemistry Teaching Fellowship Program at the University of Toronto*"

Abstract: While graduate education provides numerous opportunities for students to mature as researchers, one major concern is a gap in proper training of teaching skills beyond teaching assistantships. While teaching assistantships do indeed provide important experiences and promote the development of various teaching skills, responsibilities in these roles typically do not encompass the full range of duties required of a university or college course instructor. At the University of Toronto, a mechanism to provide contextualized pedagogical experience is offered through the Chemistry Teaching Fellowship Program (CTFP). The CTFP is offered to graduate students and postdoctoral researchers as an opportunity to undertake curriculum development and chemistry education research. Projects are run with faculty supervision and focus on designing new laboratory activities, lectures, tutorials, workshops, and assignments. Since its launch in 2002, many CTFP projects have been implemented in the departmental undergraduate curriculum. Here, the structure and history of the CTFP and its impact on undergraduate education and graduate student professional development will be presented. A selection of projects will be highlighted as case studies and factors to consider when adopting this program at other institutions will be discussed.

8. Louie Fan* (University of Toronto, ON) and Scott Browning

"*A Fresh Perspective: Designing a Laboratory Manual to Engage and Prepare Students*"

Abstract: Undergraduate students who enter the organic laboratory are expected to have learned and be ready to apply new concepts, terms, skills, equipment, and rules within the fixed amount of time of the laboratory period. Student engagement and preparedness prior to the laboratory are therefore crucial to their success in the lab. Effective communication of lab-related content through proper instructional design of the laboratory manual can dramatically assist students in their preparation. We have been exploring revisions to several components of the current manual used in our first-year undergraduate organic chemistry course for life science students. A constructivist approach has been used to introduce the experiments with the aim of creating meaningful connections between their previous knowledge to the experiments they will perform. Within this poster we will highlight the proposed changes we are making and the motivation behind them.

Poster Presentations (5)

9. Shadi Dalili* (University of Toronto Scarborough, ON) and Lucas McCann
"*Comparison of Traditional Organic Chemistry Textbooks with a Digital, Interactive Textbook in Introductory Organic Chemistry*"

Abstract: Most first and second year undergraduate chemistry courses adopt a specific hardcover text as a recommended resource to deliver the necessary course content. Typically, these texts contain written explanations and static images of content, and a myriad of practice problems assigned to students either for independent review or for assessment. Most textbooks have failed to include any interactive engagement or active learning on the part of the student. Recently, emerging educational companies such as Top Hat have created digital, interactive texts for use in undergraduate chemistry classes including all the traditional content, and also incorporating multimedia such as proprietary videos, animations, and interactive demonstrations and self-assessment exercises designed to engage students through active learning. An experiment comparing the use of a traditional text to that of the Top Hat digital interactive text and classroom response tool was designed and implemented for two subsequent sections of Organic Chemistry I at the University of Toronto Scarborough. Here, we report the results of student surveys and analysis of students' learning comparing our traditional text with the Top Hat platform. The data will be useful for future decision making on the implementation of such digital platforms across organic chemistry courses at colleges and universities.

10. Alexander Waked (University of Toronto, ON)
"*The Green Chemistry Initiative at the University of Toronto*"

Abstract: The Green Chemistry Initiative (GCI) is a student-run group based out of the Department of Chemistry at the University of Toronto in Toronto, Canada. Founded in 2012, the GCI strives to promote sustainability and green chemistry practices in both the department and the broader chemical community. The GCI provides green chemistry information and educational resources to students, faculty and staff through a variety of initiatives, including a monthly seminar series, an annual workshop/symposium, weekly trivia questions, and online resources. The group also strives to reduce chemical waste production in the Department of Chemistry through waste monitoring, as well as waste diversion with the introduction of green bins into the department for organic food waste disposal. Other initiatives include: undergraduate curriculum development in conjunction with faculty to emphasize green chemistry concepts; a YouTube video series to explore the 12 principles of green chemistry using common reactions and analogies; a campaign to reduce energy consumption from fumehoods in the department; and many more. This poster will highlight the GCI's various initiatives and provide insight into the many ways that students can help reduce waste and promote sustainable practices within their own department or university campus.

Poster Presentations (6)

11. Hossain Samar Qorbani* (University of Toronto, ON) and Maryam Abdinejad
"*Use of Augmented/Virtual Reality (AR/VR) in Education*"

Abstract: The processing power of mobile platforms is increasing rapidly while onboard cameras on these devices are more compact and powerful than ever. These cameras provide high resolution images and have advanced features such as autofocus and tracking. Parallel to such advancement, fast development of Augmented Reality (AR) platforms and Software Development Kits (SDKs) including ARPA, LAYar, Junaio, Metaio, Vuforia and several others, bring about a huge opportunity to create applications that would not be possible to build just a short few years ago. We are now able to apply these software and hardware tools elegantly to superimpose 2D/3D virtual content onto a live camera feed providing an effective educational tool for students as well as educators. Our recent experience creating 3D chemical simulation animations and AR exhibits for a local museum has motivated us to explore more uses of AR/VR and game platforms for further educational applications. This interest has led us to start the design and development of a 3D augmented reality tool, called ARchemy. ARchemy will provide a new way for students to understand chemical interactions through manipulating tactile AR markers to simulate molecular bonds in 3D space.

12. Kenneth Tran* (University of Toronto, ON), Farah Farinha and Barbora Morra
"*Developing Organic Laboratory Technique Videos*"

Abstract: In this project, several fundamental organic chemistry technique videos were created, primarily aimed at students enrolled in CHM 151Y, a first year undergraduate physical science course. The goal for these videos is to improve student performance in the first year chemistry laboratory. The techniques were researched and scripts were compiled for each component of the project and after filming, the videos were edited to incorporate annotations. Each video focuses on a specific technique without referring to a particular course or experiment, with the ultimate goal of expanding their application to other introductory organic chemistry laboratory courses in the Department of Chemistry.

Poster Presentations (7)

13. Jennifer Faust* (University of Toronto, ON) and Jessica D'eon
"*Environmental Chemistry Beyond the Classroom: A Semester-Long Industrial Consulting Project*"

Abstract: Climate change is a complex and very real problem in society today, but undergraduates are often confused about the relation between the greenhouse effect, global warming, and the ozone layer. We implemented the semester-long "Industrial Consultants Project" to compel students to actively evaluate these issues beyond the confines of the classroom. The 71 students enrolled in the 300-level environmental chemistry course at the University of Toronto were divided into teams of industrial consultants at a fictitious chemical company. The consultants were tasked with evaluating one legacy and one new hydrofluorocarbon heat transfer fluid based on environmental fate, contributions to climate change, and best business practice. All problem sets throughout the term centered on the project: students (a) calculated rate constants for reaction of their assigned compounds with OH radicals, (b) predicted breakdown products and environmental fates, (c) determined radiative efficiencies from literature IR data and computed spectra from Gaussian 09, (d) calculated global warming potentials, and (e) arrived at a consensus with their team members. Students summarized their conclusions in individual written reports, and the consulting teams pitched their recommendations to their fellow classmates, who played the role of company board members. Here we will present results from implementation of the Industrial Consultants Project during Winter 2017.

14. Shawn Postle* (University of Toronto, ON) and Barbora Morra
"*Demonstrating Green Chemistry Concepts Through Alkene Reactivity*"

Abstract: A new laboratory experiment was introduced for first year students to demonstrate green chemistry concepts, while reinforcing alkene reactivity learned in lectures. In the experiment, students employ L-proline as an organocatalyst to effect the cycloetherification of a terpene starting material, L-linalool, and generate a substituted tetrahydrofuran product. Additionally, students learn about and implement thin-layer chromatography to analyze their product mixtures. After the experiment, students apply their green chemistry knowledge by completing exercises relating to solvent selection and reagent safety. Introducing first year students to green chemistry emphasizes the importance of safety and sustainability in the chemistry laboratory, which will serve them well throughout their continuing education.

Poster Presentations (8)

15. Elizabeth Gillis* (University of British Columbia, BC), Ed Grant, Jackie Stewart and Robin Stoodley

"*Short-term Student-directed Research as a Vehicle for Learning the How and Why of Scientific Communication*"

Abstract: The existence of science relies on a deeply realized network of communication. Drawing upon diverse sources of information, an investigator develops a convincing research proposal. Peer reviewers justify funding. The scientist prepared a talk and then a manuscript, putting new results in a context of importance and relevance to existing knowledge. Discussion and peer review validate the incorporation of these new ideas in the scientific mainstream, and the cycle continues. All these forms of communication depend for effectiveness on a compelling style of writing and a convincing evidentiary structure. The conventional chemistry curriculum asks students to communicate their results in the form of laboratory reports and term papers, but seldom conveys the significance of this larger picture. As part of a new required lecture course dedicated to communicating chemistry, we have designed a project that gives students first-hand experience in the cycle of scientific communication from responding to a request for proposal to submitting the final revision of a peer-reviewed paper based on original research. Here, we describe the development and implementation of this idea and its assessment and student perspectives on its success.

16. Elizabeth Gillis* (University of British Columbia, BC), David Guan, Ed Grant, Jackie Stewart and Robin Stoodley

"*Communicating Chemistry: Targeting Communication Skills in the Undergraduate Classroom*"

Abstract: While we provide our students with many opportunities to write about chemistry, largely in the form of lab reports, they struggle to accurately express concepts and data in a clear and concise style. In 2015, the Department of Chemistry introduced a new, required course for all chemistry majors: Communication Chemistry. This course provides students with opportunities to learn and practice written and oral communication in their many forms. Class activities help students explore how the chemical frontier relies on the effective exchange of information. We employ several non-traditional teaching methods, including improvisational theatre, active learning, and collaborative learning. In this poster, we will discuss key features of the course and how we target specific skills including clear technical writing. Evidence of skill-transfer to a laboratory course and the impact on student attitudes and perspectives of communication will be discussed.

Wireless Access at the University of Toronto

The University of Toronto campus has an extensive WiFi network in all major buildings, including the Chemistry Department. Guest access to the campus wireless network requires either **eduroam** credentials or a limited term **guest id and password.** Both work over the same campus WiFi network, which supports wireless b, g and n connections using the 802.1x format, WPA2 enterprise encryption, and PEAPv0 (also known as PEAP with MSCHAPv2) authentication.

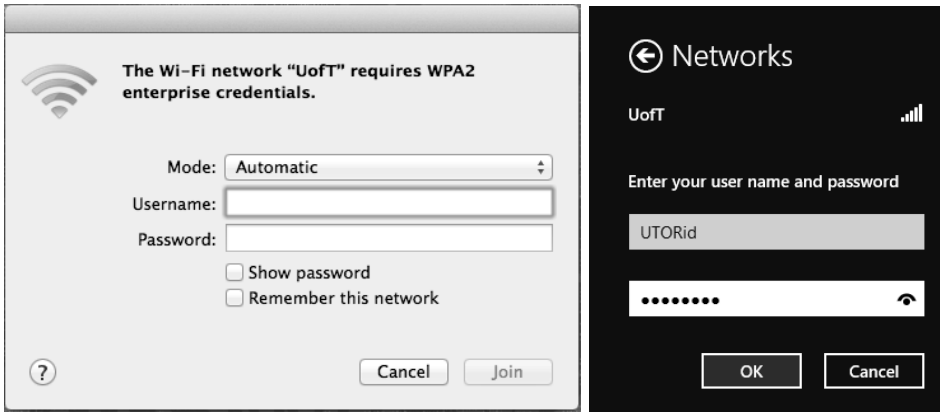
Please note that residences generally have their own arrangements; if you are staying in Victoria College or another residence, please check with them for campus wireless network availability, or access credentials for a wired connection.

Guest Credentials:

If your institution is not a member of eduroam, you will need to be issued with guest credentials. **Please contact David Stone (dstone@chem.utoronto.ca) if this is the case,** and we will provide you with credentials.

Connecting to the Network:

Select **eduroam** or **UofT** (as appropriate) from the list of available wireless networks. On recent operating systems (Mac OS 10.7 and up, Windows 8 and up) you should be able to sign in automatically by entering your user id and password when prompted:



You may receive a warning, asking you to accept a security certificate; this should be from **radius.wireless.utoronto.ca**. Please note that your eduroam user name should include your institution's domain name, e.g. **username@institution.ca**. If you need further assistance, please ask one of the volunteers at the registration desk.

44th College Chemistry Canada Conference
Attendee Contact Information

All registered attendees included as of Monday 15th May 2017

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Recommended Nearby Restaurants/Pubs

Bloor Street (close to Victoria College residence):

- Museum Tavern: 208 Bloor Street West, (416) 920-0110
  www.museumtavern.ca
  American-style taproom with craft beers, single malts, gaslight chandeliers & elevated comfort food.

Harbord Street (close to Chemistry Department):

- Harbord House: 150 Harbord, (647) 430-7365
  http://harbordhouse.ca
  A 10-minute walk from Chemistry and the organizing committee's favourite watering-hole! Excellent, varied menu and Ontario craft beer.

- Harvest Kitchen: 124 Harbord, (416) 901-5901
  http://harvestkitchen.ca
  Even closer than Harbord House! Relaxed restaurant serving carefully sourced vegetarian comfort food, plus burgers, wine & brunch.

College Street (close to Chemistry Department):

- Prenup Pub: 191 College, (416) 506-4040
  http://prenuppub.com
  A five-minute stroll south on St. George Street. Atmospheric, wood-panelled pub with Belgian & German brews, plus dishes like schnitzel & mussels.

Baldwin Street (close to Chemistry Department):

- Matahari Bar & Grill: 39 Baldwin, (416) 596-2832
  Stylish eatery blending Malaysian, Chinese & Indian cooking, plus exotic cocktails & a patio.

- Bodega: 30 Baldwin, (416) 977-1287
  www.bodegarestaurant.com
  Unpretentious bistro with a garden patio, serving inventive French-inspired fare & weekend brunch.

University of Toronto St. George Campus Map