MAALACT

MIDDLE ATLANTIC ASSOCIATION OF LIBERAL ARTS CHEMISTRY TEACHERS

52nd Annual MAALACT Meeting Announcement

We invite you to the 52nd Meeting of MAALACT, the Middle Atlantic Association of Liberal Arts Chemistry Teachers, to be held **October 25 - 26, 2019** at **St. John's University**, Queens, NY.

This meeting features a plenary lecture, a banquet dinner, and round table discussions/workshops related to chemistry sub-disciplines, writing, and assessment. This year's plenary address which will be held on Friday evening will be given by

Marcy Towns, Professor, Chemical Education, Purdue University

MAALACT provides opportunities for chemistry educators to share their ideas on pedagogy, classroom experiences, and chemical education.

Conference registration is available at http://www.maalact.org/meetings/ The registration fee is $85, and the opening dinner is $60.

A nearby hotel is the Courtyard by Marriott at 183-15 Horace Harding Expressway, Queens, NY 11365. Additional rooms are available at the Fairfield Inn and Suites by Marriott, 183-31 Horace Harding Expressway, Queens, NY 11365 (718) 746-7230.

Parking on the St. John's campus is available inside Gate 1. Please ask the Public Safety officer for a visitor parking pass.

We hope to see you in October. Please forward this announcement to any colleagues your think would be interested in attending.

Joseph Serafin
Alison Hyslop
St. John's University
Co-Chairs 2019 MAALACT

Keynote Symposium
Friday, October 25th

Marcy Towns, Professor, Chemical Education, Purdue University
Implementing Digital Badging to Assess Hands-on Laboratory Skills

Digital badges hold potential for use in the undergraduate chemistry curriculum as a means to assess hands-on laboratory skills. Badges are a set of tasks created using principles of evidence-centered design and they allow instructors to draw conclusions based on authentic evidence of students' knowledge, skills, and abilities. This type of assessment is valuable across the chemistry curriculum and especially in the undergraduate laboratory. Research has demonstrated that across the chemistry curriculum faculty identify hands-on skills as one of two over-arching goals. Assessment of these lab skills, however, is often overlooked due to time and resource constraints – especially in large courses. Digital badges address this problem by providing a platform for students to demonstrate their knowledge of hands-on lab skills while receiving direct feedback about their technique. We have developed digital badges for three techniques, pipetting, using a buret, and making solutions in a volumetric flask. These badges have been implemented across multiple populations of general chemistry students, encompassing over 3000 students each semester. This presentation will discuss the design and implementation of the badges and the results from assessments of impact on students' knowledge, confidence, and experience with these techniques.

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UPDATED MAALACT 2019 Schedule

Friday, October 25, 2019

3:00 - 8:00 Registration	Ozanam Lounge, St. Vincent Hall
4:30 - 5:00 Welcome and General Meeting	Ozanam Lounge, St. Vincent Hall
5:30 - 6:30 Happy Hour	Ozanam Lounge, St. Vincent Hall
6:30 - 7:45 Dinner	Ozanam Lounge, St. Vincent Hall
8:00 - 9:00 Plenary Lecture – Marcy Towns	DAC 206
“Implementing Digital Badging to Assess Hands-on Laboratory Skills”	

Saturday, October 26th, 2019

8:00 – 9:00	**Registration and Breakfast**	DAC 301
9:00 – 10:00	**Session 1: Workshops**	
1 A	**Alexander Grushow, Rider University**	DAC 207
	“POGIL in the Laboratory, a Hands-On Introduction”	
1 B	**Alison Hyslop & Gina Florio, St. John’s University**	DAC 208
	“Designing and Implementing Student-Driven Course-Based Undergraduate Research Experiences (CUREs)”	
1 C	**Marcy Towns, Purdue University**	DAC 209
	“Un-Badge-lievable: Digital Badges in Undergraduate Chemistry”	
10:10 – 11:00	**Session 2: Workshops and Technical Presentations**	
2 A	**Alexander Grushow, Rider University**	DAC 207
	“POGIL in the Laboratory – How to Manage The Session”	
2 B	**Alison Hyslop & Gina Florio, St. John’s University (Continued)**	DAC 208
	“Designing and Implementing Student-Driven Course-Based Undergraduate Research Experiences (CUREs)”	
2 C	**Technical Presentations**	
	Organic Chemistry	DAC 209
	Biochemistry	DAC 406
	Assessment of student learning	DAC 408
11:10 – 12:10		**Round Table Discussions**
	• Active learning in lectures	DAC 208
	• Active learning in laboratories	DAC 208
	• Active learning in recitations	DAC 208
	• Online teaching in chemistry	DAC 207
	• Laboratory infrastructure, safety, and culture	DAC 207
12:15 – 1:30	**Lunch/Close of Meeting**	BENT 201 and 202

Workshops
Saturday October 26th

1 A **Alexander Grushow, Rider University** DAC 207

"POGIL in the Laboratory, a Hands-On Introduction"

The first session will be an exploration of a laboratory activity using the POGIL framework. Participants will engage with materials and will explore the student experience in a POGIL lab environment.

2 A **Alexander Grushow, Rider University** DAC 207

"POGIL in the Laboratory – How to Manage The Session"

In the second session, we will discuss the implementation and facilitation of a POGIL-based laboratory experiment. Particular attention will be given to student work and behavior and what the faculty member does to guide students through the experiment.

1/2 B **Alison Hyslop & Gina Florio, St. John's University** DAC 208

"Designing and Implementing Student-Driven Course-Based Undergraduate Research Experiences (CUREs)"

In this workshop, we will discuss the value of course-based undergraduate research experiences (CUREs) and describe the innovative model we have developed and implemented through our NSF S-STEM award. Through this session, we will promote adoption of CUREs as a means to broaden participation of the number and types of undergraduate students engaged in authentic research experiences. We will discuss how to create student-driven CUREs that emphasize both the process and products of science. This workshop will benefit faculty and administrators who are interested in broadening participation and scaling-up undergraduate research programs.

Our "Solving the Big Problem" CURE brings together a multidisciplinary cohort of second-year STEM students to work in teams to design, develop, and carry out their own research projects focused on a central theme, a "big problem," of societal importance. Our approach centers the whole experience on the student researchers. The course serves to provide early research experience and robust disciplinary mentorship in order to improve student outcomes, e.g., increased persistence to degree completion, participation by traditionally under-represented and marginalized student populations, and enhanced self-concept as a scientist. Undergraduate research is a well-established high-impact educational practice and CUREs provide an effective mechanism to bring research to scale. This CURE can be adapted for use in any discipline, institution type, and with the resources that are available.

1 C **Marcy Towns, Purdue University** DAC 209

"Un-Badge-lievable: Digital Badges in Undergraduate Chemistry"

Digital badges are emerging in the field of education as a way for students to demonstrate knowledge tied to specific criteria and learning objectives. The badge format allows instructors to draw evidence-based conclusions about student knowledge using authentic assessment practices. While digital badges can be a useful tool for any course, they have successfully been implemented in the general chemistry laboratory as an authentic assessment of students' hands-on laboratory skills. Student videos submitted as part of the badge provide a way for instructors to give individual feedback on hands-on lab skills, while alleviating time and resource constraints that typically impede this type of assessment especially in large-scale courses. This workshop will introduce participants to the world of digital badging. Participants will see examples of badges in the laboratory and explore the possibilities for digital badging throughout the chemistry curriculum. Finally, they will begin building a badge for their own course.

O1. How Do Your Students Study?

Victor Cesare, St. John's University

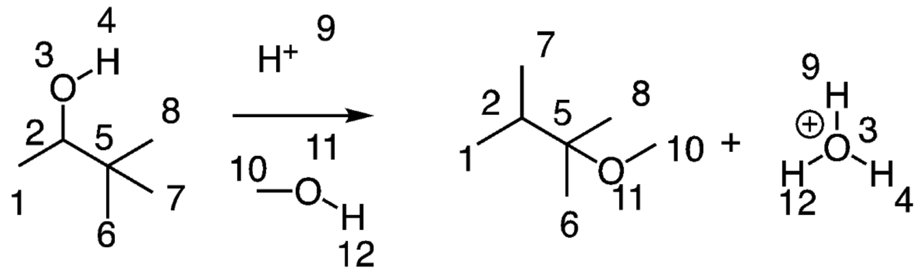
Ask any student how they learned to study and most will tell you that they taught themselves. They did not take any formal course in how to study correctly. If students are not studying properly, it will be difficult for them to succeed regardless of what modern teaching techniques we use to help our student. Indeed, most students have not given much thought to their study techniques. This presentation will talk about a study method successfully used by myself and other students to do well in a course such as organic chemistry. It consists of four steps: 1) Understand 2) Condense 3) Remember 4) Apply, which will be further discussed in this presentation.

O2. The Prime Method and the Active Atom as Tools for Teaching Arrow-Pushing Mechanisms in Organic Chemistry

Daniel L. Silverio* and Arun Sam

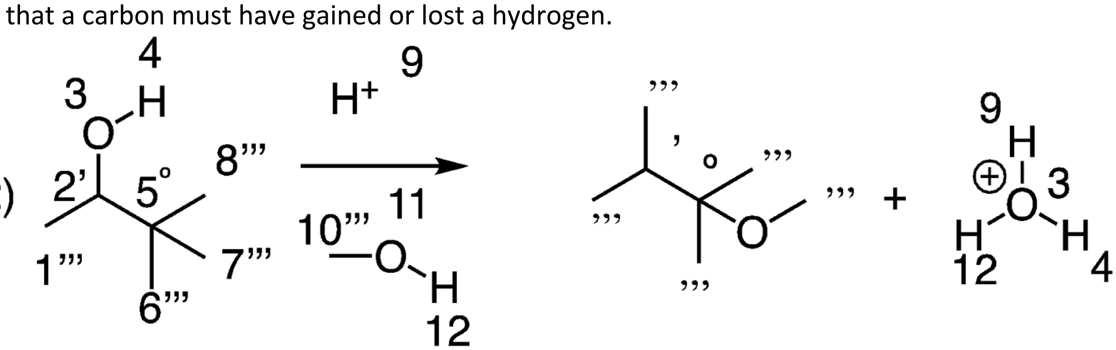
The ability to interpret and provide arrow-pushing mechanisms is crucial for students to obtain a deep understanding of organic chemistry. Without this ability, students are often stuck memorizing the details of every reaction individually rather than understanding what is going on in a given transformation. This memorization approach usually proves infeasible as the amount of mechanisms to memorize becomes larger until it reaches an impossible level.

A classic way to teach students how to work out mechanisms is to have them work out what bonds are broken and what bonds are formed. As seen in Eq. 1, this entails students mapping which atoms in the starting material(s) are which atoms in the product(s) followed by determining which bonds broke and which bonds formed. A mechanism is then proposed with the aid of this information.

1) 

bonds broken	bonds formed
2–3	9–3
5–7	7–2
11–12	3–12

In practice, the most difficult part of the process is mapping the atoms in the starting material(s) to those in the product(s). Using the "prime method" students explicitly represent the amount of hydrogens on the carbon atoms (º = 0H, '= 1 H, " = 2H, ''' = 3H). With this method, decisions students need to make regarding mapping atoms are simplified (Eq. 2). The prime method also works well when a mechanism involves C-H bonds being broken or formed (e.g., eliminations) by giving students a way to realize that a carbon must have gained or lost a hydrogen.

2) 

Once a bonds broken/formed chart is created, students can use the "active atom" approach as a guide for what order steps in the mechanism will occur. For example, in a cationic mechanism, the active atom is the atom with a positive formal charge, and any step in such a mechanism will always involve electrons flowing towards that "active" atom.

O3. Investigating student misconceptions in understanding acid-base reactions in undergraduate organic chemistry courses using various formative and summative assessment tools.

Dr. Manashi Chatterjee, Chemistry Department, Hunter College, CUNY, New York, NY, 10065

Despite introduction of acid-base reactions from General Chemistry, students in organic chemistry courses struggle with Acid-Base concepts. Students also show a low retention of acid-base chemistry knowledge as they progress during the Organic Chemistry sequence. Students have difficulty comprehending the fundamentals of acid-base concepts when they have to apply Acid-Base principles in Organic Chemistry laboratory courses and while writing advanced mechanisms.

Analysis of i-Clicker and Multiple Choice (MC) exam data from various Organic Chemistry I and II lecture and laboratory courses have been used to determine the concepts where students exhibit misconceptions and deficiencies in applying acid-base reactions correctly. Data collected from the following three sources to identify and examine common misconceptions are: (1) Screenshots of student work captured using iPads at the point of delivery during lectures (2) Data from the electronic voting system (i-Clickers) (3) Data from online homework. Analysis of all three provides valuable formative assessment data that provide valuable feedback of student misconceptions. Assessments of learning outcomes are measured by comparing the responses from i-Clicker sessions (in class formative assessment) with similar questions from Scranton MC exam data. A study of these results will be presented. Techniques to design learning activities to alleviate these misconceptions in acid-base reactions will be proposed and provide instructors a mechanism to detect early warning signals for students who may not ultimately succeed in Organic Chemistry.

ASSESSMENT OF STUDENT LEARNING DAC 408

A1. Instructional Strategies to Promote Active and Cooperative Learning in Chemistry

Monica ILIES, Drexel University, Philadelphia, PA

This presentation summarizes and exemplifies the different evidence-based pedagogical strategies implemented in undergraduate general, organic and introductory medicinal chemistry courses taught in a quarter system. These strategies were adapted to fit both large- and small-size classes (12 to 230 students), as well as different student populations. The presented strategies include

1) problem-solving through "think-pair-share" and small-group work;
2) the muddiest point technique (also converted into live student evaluations);
3) student engagement in test writing;
4) partially flipped-classroom;
5) the "study-buddy" system; and
6) clicker questions specifically designed to evaluate independent thinking, self-assessment and “self-troubleshooting” skills.

Pros and *cons* of each strategy will also be discussed.

A2. Bringing Nuance to Automated Exam and Classroom Response System Grading: A Tool for Rapid, Flexible, and Scalable Partial-Credit Scoring

Tom P. Carberry, Philip S. Lukeman, and Dustin J. Covell* St. John’s University

We present here an extension of Morrison’s and Ruder’s “Sequence-Response Questions” (SRQs) that allows for more nuance in the assessment of student responses to these questions. We have implemented grading software (which we call ANGST, “Automated Nuanced Grading & Statistics Tool”) in a Microsoft Excel sheet that can take SRQ answer data from any source and flexibly and automatically grade these responses with partial credit. This allows for instructors to assess a range of understanding of material from student-generated answers as in a traditional written exam, while still reducing grading workload for large classes. It also allows instructors to do automated statistical analysis on the most popular answers, and subanswers, either from sources like exams or classroom response systems (CRSs), to determine common misunderstandings and facilitate adjustments to instruction.

BC1. Five Semesters Teaching Biochemistry, No Two Alike!

Eric P. Chang Pace University Department of Chemistry and Physical Sciences, New York, NY 10038

Eric Chang, Assistant Professor of Biochemistry at Pace University, shares his experiences and best practices teaching biochemistry on two different campuses and online to diverse student populations. Since joining Pace in 2017, Eric has taught introductory and advanced biochemistry using traditional lecture and flipped classroom models. Additionally, he has incorporated training in bioinformatics and the use of case studies into his lectures. At Pace, introductory biochemistry is considered a writing enhanced course and requires a large portion of the grade to be assessed on an original piece of writing. Through this mechanism, Eric mentored a group of students in writing and publishing a mini-literature review on the effects of spaceflight on mammalian metabolism. Eric is now working with his current advanced biochemistry students in writing case studies based on recently published peer-reviewed articles, which he ultimately plans to compile and publish.