Poster Session

20th Annual POGIL National Meeting
Saturday, June 4, 2022
8:00-9:00 PM

1. Introducing Students to a Systems Thinking Model

Jenny Loertscher – Seattle University (WA)
Alyssa Konopaski – Seattle University (WA)
Renata Everett – Seattle University (WA)

Abstract: Systems thinking has been widely acknowledged as the next step for science education because of its ability to enhance students' critical thinking and problem solving while increasing engagement with key concepts. Systems thinking invites students to explore trends, emergent behaviors, and relationships between components of a system. Practicing systems thinking in the classroom will make future scientists better equipped to face contemporary problems such as climate change, ecosystem destruction, plastic recycling and more. To improve systems thinking skills in a general chemistry laboratory, we updated curricular materials associated with a two-part water quality laboratory. Changes included updating existing pre- and post-lab questions to promote higher order systems thinking skills and developing a POGIL style activity, which guides students through an exploration of the Systems Thinking Hierarchical Model (York and Orgill, 2019). Analysis of student responses to new pre- and post-lab questions and the activity is underway and will be used to inform future instruction.

2. Navigating a New Discipline in POGIL

Neal MacDougall – California Polytechnic State University–San Luis Obispo (CA)

Abstract: The introduction to POGIL is easiest to do when there are existing materials from which an instructor can work. This results in the opportunity to focus on the development of facilitation of teams even as the instructor works to understand the structure of POGIL activities. In many respects, there is a co-coordination of learning facilitation and understanding the structure of POGIL. When an instructor adopts POGIL but has no materials ready, there is a necessary emphasis on the development of guided inquiry materials. This slows down the development of facilitation skills since it is less likely that the POGIL-like materials will not exhibit the same structure as more highly developed POGIL activities. The experience of "backward" POGIL-ing may inform how POGIL may adjust its strategies for moving into new disciplines.

3. Integrating Polymer Content into the Existing Undergraduate Laboratory Curriculum

Kristy Mardis – Chicago State University (IL)
Andrea Van Duzor – Chicago State University (IL)
Mary van Opstal – Harper College (IL)

Abstract: In response to the American Chemical Society call for increased polymer content in the undergraduate curriculum, we have been developing new laboratories to engage general chemistry students in the theoretical and practical applications of polymers. To ensure that students think deeply about concepts, all new labs are constructed using the POGIL model where students are lead through the learning cycle of concept exploration, invention, and application. To encourage student engagement, all new labs were reviewed by paid beta testers, five junior and senior majors in the department, who gave feedback on best models, question structure, and interest. In this session, we will outline several of the new laboratories, including creating property flowcharts to differentiate recycling polymers and using the engineering design process to model and create slimes. We will then discuss the process of creating the labs using the POGIL framework and student feedback. Upper level students reviewing the labs served not only to improve the quality of the labs for general chemistry students but also reinforced the importance of student voice in decision making and community building in the department.

4. IntroCS-POGIL: Process Oriented Guided Inquiry Learning In Introductory Computer Science

Chris Mayfield – James Madison University (VA)
Helen Hu - Westminster College (UT)
Clif Kussmaul – Green Mango Associates, LLC
Aman Yadav - Michigan State University (MI)

Abstract: We are wrapping up a 5-year NSF IUSE project about improving faculty adoption of POGIL in computer science. We created a five-stage professional development program that included summer workshops, peer mentoring, individual reflection, and community engagement. We trained over 60 instructors at 45 institutions and impacted over 5000 students. We refined and disseminated 3 sets of activities for CS1 in Java and Python. Our project involved a broad range of undergraduate institutions including liberal arts colleges, research universities, community colleges, and minority serving institutions. We published two book chapters, two journal articles, five conference papers, more than ten workshops and special sessions at national conferences, and a website providing public information. This poster

summarizes research highlights and new knowledge regarding barriers to faculty adoption, effective support for faculty adoption, and student outcomes including sense of belonging, teamwork, and learning outcomes. The results of this work will inform future efforts to design professional development of STEM faculty.

5. Guided Investigations on Geometry Software ARE the "Models"

Chris Oehrlein – Oklahoma City Community College (OK)

Abstract: Many faculty members have class activities that they do not formally write as or convert into official POGIL activities. They do, however, create activities that are inspired by the POGIL Project – activities that do not fit all of the requirements to be POGIL, but that reflect and use many of the principles and motivations of the Project. One such example is using software for concept development, but where there is not a model in the purest sense of POGIL. The sequence of questions guiding students to create and explore diagrams, measurements, and calculations becomes a sort of "model" itself. In a college Geometry course for future PreK-8 teachers, instructors use geometry software to guide students through the creation of figures or diagrams. Through the process of what can/cannot be drawn, what can/cannot be measured or calculated, and what could/could not be investigated further under certain parameters and conditions, the students develop concepts about measurement accuracy, similarity, congruence, angle relationships, patterns and formulas, etc.

6. Student Engagement in an Introductory-Level College Chemistry Course in Relation to Students' Lived Experiences

Joan Roque – University of Puerto Rico at Cayey (PR)

Abstract: Student engagement (SE) is essential for student success; it is also extremely complex. SE can be seen as a combination of behavioral, cognitive, and emotional engagement; therefore, we must look at it holistically. As an educator, I wanted to explore how students' lived experiences affect their engagement in education, especially after seeing students engage or not engage during POGIL instruction. Therefore, in this qualitative, action research study, I explored the relationship between students' lived experiences and engagement. I followed the triangulation method for data collection and collected data through several sources, classroom observations, interviews, student work, and reflections. As I collected and analyzed my data, I followed the constant comparison method, which helps researchers continuously compare their data so that we can draw patterns. As I started seeing those patterns and codes, five

themes that affect SE emerged — university environment, classroom environment, living environment, wellbeing, and motivation. Those themes, along with their subthemes, demonstrate the relationships between students' lived experiences and their engagement. They impacted student engagement in positive or negative ways, depending on the situation. These factors, along with the use of POGIL will help me develop guidelines for more engaging chemistry courses at my institution.

7. Teamwork Rubric That Supports Building Community and a Sense of Belonging

Suzanne Ruder – Virginia Commonwealth University (VA)

Abstract: The ELIPSS project has modified the teamwork rubric to include a category of building community. Observable characteristics include: a) Fostered a sense of belonging to the team for all team members. b) Acted as a single unit that did not break up into smaller (fragmented) units for the entire task. c) Listened carefully to people, and gave weight and respect to their contributions d) Openly and respectfully resolved disagreements between team members. e) Invited/welcomed and valued the individual identity and (experiences) of each team member. Students were provided feedback and were asked to reflect on their sense of belonging during in class POGIL activities. The results of the reflections and end of semester survey will be discussed.

8. Are students who take introductory classes taught using POGIL more likely to graduate with a science major than those whose introductory classes are taught using lecture?

Tracey Murray – Capital University (OH)

Abstract: I was asked a variation of this question by a colleague years ago and realized that I didn't know the answer. I don't believe it has been answered by others – although there are hints of this in some POGIL articles. For example, Hanson and Wolfskill noted a 15% increase in enrollment in organic chemistry after they started using process workshops in their general chemistry classes. (J Chem Ed, 2000) The best way I could look at this data at my own institution was to compare students who took my section (POGIL) of general chemistry in their first semester on campus and see how many of them graduated with science majors. I could then compare that to students who took the other sections (lecture) of general chemistry. I was pleasantly surprised to find that 54% of the 24 students in my Fall 2018 section graduated with a science major, compared to 42% of the 69 students in the other three Fall 2018 sections. However, I only have this one data point and there are many

confounding variables that could explain the difference – including pure coincidence. I am hoping to start a discussion with my POGIL colleagues to find out 1) Is this data already published somewhere and 2) Are there other faculty who have this data (or could get it) and would be interested in working with me to see if the correlation holds?