

The POGIL Inquirer

In the Spotlight

Tracey Murray, Capital University

Teaching Students to Read Primary Literature Using POGIL Activities

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From The POGIL Project Director



Dear Friends,

I hope that your fall semester has been productive and not too stressful!

Here at The POGIL Project, we are wrapping up another very successful workshop season. Over the summer, we not only held regional workshops, but debuted our first few regional summits, bringing together practitioners from across the country to discuss best practices, create and edit activities, and build a stronger network across disciplines. These new events have been well received and we're already

looking forward to next summer's workshops!

The POGIL Project has also just completed its very first Pledge Week. Over the course of five days, we sought to gain 150 new donors to The POGIL Project. We weren't sure what to expect from this new fundraising format, but everyone here at The Project was amazed with the response from all of you, the new connections we gained, and the wonderful messages of support that we received from the POGIL community. Thanks to you, we increased our donor base for The Project by more than 50%, and I'm so thankful to everyone who helped make POGIL Pledge Week a huge success!

I hope to see you at a POGIL workshop, regional meeting, or regional summit soon to thank you in person, but until then, I wish you a very successful rest of your semester, and a safe and reflective holiday season!

Richard S. Moog

Upcoming POGIL Events

Workshops

- December 4 Syracuse University – Intro Workshop
 January 23 Red Deer College – Intro Workshop

Regional Meetings for next year are in the planning process and will be posted in January of 2015. Also stay tuned for news of our Facilitator Training Workshops in July of 2015.

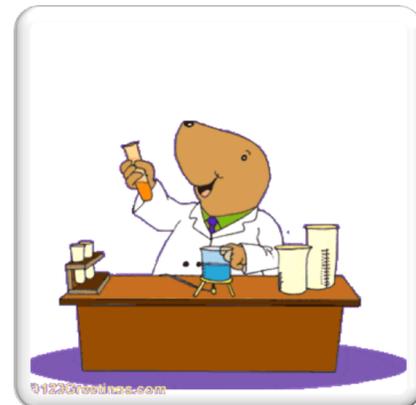
For more information on upcoming POGIL workshops, visit www.pogil.org

Ask The Mole

Q: How do POGIL and SoTL work together to achieve their goals?

A: Scholarship of Teaching and Learning (SoTL) is a growing movement in scholarly inquiry that advances the practice of teaching by making research findings public.

According to Megan Hoffman, professor of biology at Berea College, and one of the authors of POGIL's SoTL workshop session, SoTL collects data from classrooms for analysis on how students are learning. One of the major questions SoTL asks is "Can we tell if and how students are learning?" Through its studies, SoTL provides feedback for teachers on how they can improve their students' learning, as well as those seeking information on how people learn.



POGIL provides an ideal environment for these studies because of its process skills and inquiry-based approach to learning. POGIL's working definition of SoTL is "investigations that begin with the purpose of understanding and improving teaching and learning within a classroom or institution, leading to results that can be shared beyond the classroom." POGIL is also a gateway for many practitioners to discover SoTL and help them get started on a particular path of research.

If you have any questions regarding inquiry learning, POGIL materials, or any POGIL-related knowledge, email us at mdubroff@pogil.org.

STEM Reform Network Findings

Representatives from four undergrad STEM reform networks, including POGIL, recently attended a meeting in Washington, D.C., to discuss the results of an NSF-funded project: Achieving Scale for STEM Reform. The project studied these four networks in order to understand how the networks could be most effectively designed to spread innovations amongst network members and beyond.

The principal investigators of the project were Adrianna Kezar and Sean Gehrke of the University of Southern California. The other three networks examined were BioQuest, Project Kaleidoscope, and SENCER. Kezar and Gehrke employed a mixed-method study using interviews with network leaders and an electronic survey of participants within the network.

What they found was that the designs of the networks had more in common than expected and while they all had unique paths in their formation, they all had a similar trajectory.

Kezar and Gehrke will be writing several papers on their findings and will share them with the POGIL community in early 2015.

How I Stopped Lecturing – Stephen Prilliman



When I finished graduate school I made an unusual choice. Instead of pursuing a post-doc, I moved back to my hometown, Oklahoma City, and became a founding teacher at a charter high school. And there I taught science the way I had been taught science, from high school through grad school. I lectured nearly every day. I also conducted labs that were similar to labs I had encounter in my own education, mostly labs that practiced skills and calculations we had already learned in lecture.

After two years of teaching this way, I came across two problems. The first was my students weren't learning anything from my lectures. Obviously this was my students' fault (or perhaps their middle school teachers' fault), since my lectures were nothing short of brilliant. The second and more bothersome problem was that the way I was teaching science had very little to do with how I had practiced science as a graduate student. In grad school, I took on a project that had only vague rules to it. There was a chemical system (iron oxide nanocrystals) and a technique (I won't bore you with the details), but that was it. The project was guided by speculation about previous data, then planning experiments, then collecting data, then speculating about the data, then planning more experiments, then more data. This problem bothered me more because there was no way to blame my students for this.

Somewhere in my brain, an idea was half forming, that maybe we could teach science starting with data. About the same time I had a disconcerting interaction with a student which convinced me that my students were learning very little and harboring significant scientific misconceptions (such as that carrots are not plants). Then I attended an American Chemical Society meeting in San Diego and attended a Chemical Education session that seemed to be mostly about AP and General Chemistry. The session was all about a teaching method I had never heard of called POGIL. I didn't fully understand it, but later at the expo I met Jim Spencer, who helped develop the POGIL method and who pushed a book into my hand (under the unhappy eye of the textbook salesman) and said "Here, take this, you need to do this."

POGIL would turn out to revolutionize my teaching. In that workbook were activities for students to be used in small groups in which the students were provided data and had to draw conclusions from it. In other words, they had to learn from the data rather than from me. The students finally had to do what I did in graduate school – construct their own understanding, starting from data. I immediately tried it with my students, and remember very clearly one of my most difficult, disengaged students telling me, "Dr. P, this is *good*."

I had some fits and starts implementing POGIL the next year, but eventually I had a system down. I found that I was more successful writing my own activities for my students because at the time there were only college-level texts and I was working with sophomores and juniors at an urban high school. By my fourth year of teaching high school, I was using POGIL nearly every day, either in lecture or lab. I now teach at the college level and I almost never lecture except on days when I have to convey algorithmic problem solving techniques like unit conversion. Otherwise my students work in small groups on the POGIL activities I have written and, without giving a lecture, my students learn the material and more. They also learn how to work in a group, to pace themselves, to take ownership of their learning and assess whether or not they understand. They learn not only the chemistry, but also a set of skills for being independent scholars.

Prilliman, continued from page 3

While I was teaching with POGIL at the high school, the POGIL Project, a group that teaches about and promotes the use of POGIL, began fostering projects for high school teachers that eventually produced workbooks for high school chemistry, high school biology, AP Biology and most recently a lab manual for AP Chemistry. Hundreds of teachers around the country are now using POGIL every day to enhance the education of their students. I was lucky to be a part of the early work on this, and I owe it to Jim Spencer for giving me a book and the POGIL Project helping me see a way to teach in some way other than through lecture.

This piece is reprinted with Prilliman's permission and originally appeared on his blog at <http://simplecandle.wordpress.com/2014/10/24/how-i-stopped-lecturing/>

POGIL Steering Committee Discusses Updates to Strategic Plan

Recently the POGIL Project Steering Committee met to discuss advances to the Strategic Plan and progress on its various projects. Updates included formalizing the 60-minute introductory presentation to allow people to share and get a taste of POGIL in a non-typical workshop environment. If you are facilitating a one-hour POGIL workshop, the materials are available in the facilitators' Dropbox. Please contact the POGIL office if you are a POGIL facilitator and do not have access to this Dropbox folder.

POGIL Summits were introduced this year with three successful meetings. These summits brought together POGIL practitioners in smaller and less formal groups. Topics discussed included how to implement POGIL strategies and obstacles faced particular to a region. Tim Herzog (Weber State) said, "We had a great time sharing challenges that we have faced, solutions that we've tried, and brainstorming ideas for implementation in our many different teaching environments... it was a great way to recharge in the middle of my semester and get inspired again about teaching." Another summit attendee, Mare Sullivan, explained there were, "three very different teachers from three very different academic settings - all [coming] together and [helping] each other ... It was a joy to behold!"

A white paper for the Activity Development Network has been prepared, outlining the functions and parameters of the network. It will be an online, moderated resource for activity authors and educators wishing to find, read, and test activities. This will also allow the facilitation of effective and rapid activity production leading to publication.

One very exciting project is POGIL India. This project works to increase awareness and implementation of POGIL and other active learning strategies in India, and to support the development and sharing of POGIL activities. At the end of August, a proposal was submitted to *Indo US Science & Technology Forum* for an international workshop. POGIL is still waiting on a response but if the proposal is accepted, the project will move forward.

In the Spotlight: Tracey Murray

Teaching Students to Read the Primary Literature Using POGIL Activities



Capital University's Tracey Murray recently published a study conducted on her students to see how confident they felt about reading primary documents after using the POGIL methodology.

Tracey Murray recently completed a study in her classes at Capital University. Already teaching with the POGIL philosophy, she decided to use POGIL methodology to approach primary sources to teach her students some strategies for reading and comprehending the material. Murray wrote activities to help students develop these strategies for reading the primary literature. After using this approach, students felt more confident to approach the literature from these activities.

Q: Why did you decide to do this project?

A: I wanted my students to have more training in how to read research papers. My class was already taught using the POGIL philosophy, so it just made sense for me to write activities in that style. Once I got started, I realized that POGIL was a natural fit for teaching students to approach data from the primary literature. I wanted to determine if my students were doing a better job of reading the literature after we did the activities, so I decided to

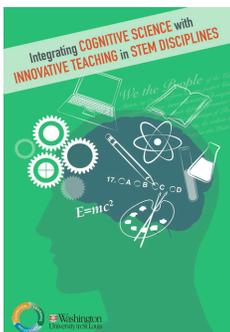
Q: Can you elaborate on how you set up this POGIL trial?

A: My class was already being taught using POGIL materials, so all I really needed to do was write the activities, a pre-test, and exam questions and then complete the IRB forms necessary to do the study.

Q: Why do you think the POGIL project was so successful in your classes?

A: I think the POGIL philosophy works really well for teaching students to read and interpret data from the primary literature. The data and experiments from the paper become the models that the students explore in typical POGIL activities. The students work in groups to interpret the data themselves, rather than listening to a lecture from the professor about what that data means. This makes it much more likely that they will figure out a successful way to approach the literature. However, the professor is available for facilitation when the students get stuck. Most primary literature is not written at the undergraduate level, so it is important to have help when the authors assume knowledge that undergraduate students are unlikely to possess.

New POGIL Publication



POGIL announces a new e-publication: *Integrating Cognitive Science With Innovative Teaching in STEM Disciplines* with a chapter written by POGIL Director, Rick Moog.

Part of a larger collection on teaching and learning, the chapter of *Integrating Cognitive Science with Innovative Teaching in STEM Disciplines* titled “Process Oriented Guided Inquiry Learning” explains how a POGIL learning environment is set up and works to improve learning. The chapter talks about how group activities are set up to support the development of process skills and how these activities, with an instructor as a facilitator, help the development of student concepts and process skills instead of simply delivering the content to students.

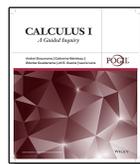
POGIL Books Now Available at WILEY.COM

The POGIL Project and Wiley are happy to announce that almost all of POGIL’s activity offerings are now available on the Wiley.com site. These titles include:

- *Analytical Chemistry: A Guided Inquiry Approach* (Lantz and Cole)
- *Calculus 1: A Guided Inquiry* (Straumanis, Beneteau, Guadarrama, Guerra & Lenz)
- *POGIL Activities for Introductory Anatomy and Physiology* (Jensen et al.)
- *Quantum Chemistry & Spectroscopy: A Guided Inquiry* (Shepherd and Grushow)

In order to place an order for any of these books, please visit www.wiley.com. Instructor guides can also be obtained at this website.

Physical Chemistry: A Guided Inquiry/Thermodynamics (Spencer, Moog & Farrell) is still located at customselect.wiley.com.



CS-POGIL Community Update

The POGIL community in the Computer Science Activities continues to grow. There are more than 50 people in the Google Group, and <http://cspogil.org> has nearly 100 activities drafted by more than 10 people.

With the generous support of the POGIL Project, a diverse team worked during the summer of 2014 to draft and revise more than 10 POGIL activities for a high school CS Principles course, which are being beta tested this year by a larger team of teachers, in preparation for a revised NSF proposal in the spring of 2015.

CS-POGIL community members have been involved in a variety of projects. Clif Kussmaul's NSF CS-POGIL project is in its fourth year. It has sponsored more than 10 POGIL workshops at a variety of CS and engineering conferences and has provided support for CS teachers to attend POGIL regional meetings. Helen Hu's AACU TIDES project is in its first year. It is developing and revising POGIL activities with a particular emphasis on diversity and multiculturalism, to be used in CS Principles courses paired with courses in other disciplines. Other community members have been involved in various projects and grant proposals. For example, several teachers have teams use Google Docs instead of paper activities because it makes it easier to copy code and the results between the activity and other tools. CS has a Google Doc add-on to assist authors and teachers.

2014-15 POGIL Regional Coordinators

North Central Region (Formerly Great Lakes)
(IA, IL, IN, MI, MN, ND, NE, OH, SD, WI)
Audrey Armoudelin, Cranbrook Educational Community
(aarmoudlian@cranbrook.edu)

Northeast Region
(CT, DC, DE, MA, MD, NH, NJ, NY, ME, PA, RI, VT, WV)
Kris Lantzky-Eaton, St. John Fisher College
(klantzky@sjfc.edu)

Northwest Region
(AK, ID, MT, OR, WA)
Mare Sullivan, Bellevue Christian School (retired)
(joe.mare.sullivan@gmail.com)

South Central Region
(AR, KS, LA, MO, OK, TX)
Marty Perry, Ouachita Baptist University
(perrym@obu.edu)

Southeast Region
(AL, FL, GA, KY, MS, NC, SC, TN, VA)
Patrick Brown, East Tennessee State University
(brownp@etsu.edu)

Southwest Region
(AZ, CA, CO, HI, NM, NV, UT, WY)
Matt Horn, Utah Valley University
(hornma@uvu.edu)

Please contact any of the Regional Coordinators if you have any questions about events or workshops in your region.

New POGIL Video Now Online

The POGIL Project is pleased to present its new video "What is POGIL" at <https://pogil.org/about>. Can the Sundance Film Festival be far off?



POGIL Published Works

Teaching Students to Read the Primary Literature Using POGIL Activities

T. A. Murray

Biochemistry and Molecular Biology Education (2014), 42(2), p.165-173

ABSTRACT: The ability to read, interpret, and evaluate articles in the primary literature are important skills that science majors will use in graduate school and professional life. Because of this, it is important that students are not only exposed to the primary literature in undergraduate education, but also taught how to read and interpret these articles. To achieve this objective, POGIL activities were designed to use the primary literature in a majors biochemistry sequence. Data show that students were able to learn content from the literature without separate activities or lecture. Students also reported an increase in comfort and confidence in approaching the literature as a result of the activities.

Use of a Modified POGIL Exercise to Teach Bacterial Transformation in a Microbiology Course

E. A. Mulligan

Journal of Microbiology & Biology Education (2014), 15(1), p.30-32

The allied health microbiology course at Kingsborough Community College (KCC) includes a unit on bacterial lateral gene transfer, which considers the process of transformation. KCC's diverse student population often finds this abstract concept challenging. Compounding this is apathy, because students do not see the topic as useful for their chosen career path, which manifests as a lack of engagement. This learning challenge provides an ideal opportunity for students to engage in a collaborative assignment using summaries and diagrams, which are known to be effective learning methods. Collaborative assignments are high-impact educational practices that are encouraged in higher education. This paper describes a modified process-oriented guided-inquiry learning (POGIL) exercise used to teach transformation. POGIL is one type of small group activity in which students are engaged by giving them specific roles as they proceed through the activity's exploration, concept development, and new concept application phases. POGIL is well-established for chemistry classes, and is also an effective learning technique for biology students.

Students were skeptical about the exercise but after completion, reported they enjoyed and preferred it to lecture. One student said, "I got to do something; it was active." Another reported, "Seeing how [the scientists] figured out how it worked helped me understand it." Due to this positive feedback, the number of lectures replaced by this type of exercise is being expanded.

Diversity in POGIL

Dr. Helen Hu recently presented a one-hour tutorial on "Encouraging Diversity via POGIL" at the Rocky Mountain Celebration of Women in Computing. This workshop motivated the need for a culturally competent curriculum and explored how pedagogy can impact equity. It then provided an introduction to process-oriented guided inquiry learning (POGIL). Inquiry-based classrooms better incorporate a wide diversity of perspectives than traditional classrooms. Since adopting POGIL in her CS-1 class, Hu has seen her female pass rates increase from 74% to 86%.



POGIL Published Works Continued

Use of Toulmin's Argumentation Scheme of Student Discourse to Gain Insight About Guided Inquiry Activities in College Chemistry

U. Kulatunga, R.S. Moog, J.E. Lewis

Journal of College Science Teaching (2014), 43(5), p.78-86

This study explored student discourse in a small group learning setting to gain insight about the relationship of various features of general chemistry guided-inquiry activities (ChemActivities) to the production and sophistication of arguments produced by student groups. These published materials (Moog & Farrell, 2008) are influenced by the Learning Cycle and are designed to for use in groups. The Learning Cycle, described in more detail in the next section, is a pedagogic strategy derived from constructivism (Bodner, 1986) and developmental theory (Piaget, 1970) and is aligned with the way most students learn effectively (Abraham, 2005; Lawson, 1995). Although previous studies have shown that the Learning Cycle approach leads to higher science achievement, improved retention, and better reasoning abilities (Lawson, Abraham, & Renner, 1989; McComas, 1992), they have not explicitly explored how to create Learning Cycle experiences that are particularly effective in prompting student argumentation by general chemistry students.

Development of lifelong learning strategies using inquiry guided learning projects in first year anatomy course

D. Bentley

The FASEB Journal (2014), 28(1)

ABSTRACT: Biomedical science courses are often crammed with mandatory content. As a result, students may develop passive learning strategies; relying on the instructor to 'give them' knowledge. For instance, students self-report (pre-semester survey, 10-pt Likert) as lack of confidence in the exploration of research on a scientific topic (6.4 ± 1.1) outside of formal instruction. To evade this passivity and to promote lifelong learning strategies, Inquiry Guided Learning Projects (IGLPs) have been developed for first year Gross Anatomy; piloted in 2012, then evaluated/reformatted and integrated in 2013. Aligned with student desires to develop skills in effective communication (8.1 ± 1.9) IGLPs facilitation include 4 novel Information Sessions and 3 Check-Ins that guide students through the Information Search Process (ISP); initiation, selection, exploration, formulation, collection, and presentation. The guiding aspect was imperative, as students indicate poor self-perceived abilities of research question selection (6.6 ± 1.7), answer exploration using peer-review literature (6.4 ± 1.2), and effective scientific communication (6.3 ± 1.5). The effect of IGLPs on change over time in student-perceived confidence and self-reported ability in all ISP stages will be tested with a repeated measures ANOVA. IGLPs prepare students to be active learners; confident in their ability for academic discovery following formal education.

Looking to Book a Workshop?

- If you would like to bring a POGIL workshop to your area, please get in touch with us! We are interested in teaching more instructors about POGIL at both the high school and post-secondary levels and want to help them make their classrooms and laboratories more student-centered.

Please visit our website and submit an event request at <https://pogil.org/contact/enter-request> or email Marcy Dubroff at mdubroff@pogil.org

- Congratulations to Cheryl Bailey on being named dean at Mt. Mary College.



Send us your news!

We'd love to feature your news, your grant, or your video on the POGIL website and in the POGIL newsletter. Send news to Marcy Dubroff at mdubroff@pogil.org

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The POGIL Project

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