

The POGIL Inquirer

From the POGIL Project Director



Welcome to the latest edition of The POGIL Inquirer. In addition to having a new name for our newsletter, I am excited to share some great news about the future of The POGIL Project.

Beginning in July '11, the POGIL Project officially became a 501(c)3 not-for profit entity. While we will continue to be

housed at Franklin & Marshall College, we will operate as an independent entity. In fact, we have already submitted grants to the NSF, NIH, and the US Dept. of Education as The POGIL Project, rather than through F&M. And, we plan to continue offering workshops and events as we have in the past, but mainly on a fee-for-service basis.

We are also excited about several recently funded curricular materials development projects that will take us in some new directions. These include computer science; anatomy and physiology; general chemistry content related to climate change; physical chemistry laboratory and calculus and pre-calculus. Look for details of who is involved on the POGIL website!

As always, we encourage your feedback. I look forward to hearing from you!

Rick Moog

Upcoming Workshops

Northwestern University
Evanston, IL
9/24

NABT 2011
Anaheim, CA
10/12 - 10/15

Tufts University (private)
Boston, MA
10/15

Clemson University (private)
Clemson, SC
12/19

Spring 2012
Parsippany, NJ
Cincinnati, OH

For more information on upcoming workshops, please visit the POGIL website at www.pogil.org.

We have a name!

In our inaugural issue, we asked our faithful POGIL readers to help us name our newsletter, which was, uninspiringly dubbed *The POGIL-zine**. We are happy to report that we now have a much more suitable moniker for our fledgling publication — *The POGIL Inquirer*.

The name was submitted by **Roy Cohen** at **Xavier University** and was unanimously selected by The POGIL Project national office staff. For his winning entry, Roy received a POGIL polo shirt and our sincere thanks for saving us from another issue with an asterisk next to our name!

NSF Funding Secured to Support Development of POGIL Activities for Entry-Level Anatomy and Physiology

Forty college and high school anatomy and physiology (A & P) instructors recently attended a POGIL workshop supported by funding from the National Science Foundation, the Minnesota State College and University System, and the University of Minnesota's College in the Schools Program and College of Education and Human Development. The event, held at Minneapolis Technical and Community College, had a twofold purpose: to introduce instructors to the POGIL teaching and learning philosophy, and to provide time for small groups of instructors to begin creating POGIL curriculum activities. The workshop is part of a two-year NSF-funded project led by Dr. Murray Jensen (University of Minnesota) to develop, evaluate, and publish a set of POGIL activities for introductory A & P courses.



Instructors from a wide range of educational institutions attended the event, including 15 high school teachers who teach college-level A & P courses in addition to other courses that typically include biology, ecology, or chemistry. A variety of two- and four-year colleges and universities from across Minnesota and from Wisconsin, Iowa, Nebraska and New York were also represented. These instructors worked in groups organized by body systems and drafted 12 POGIL activities to be used in their courses during the fall semester.

Over the next two years, Jensen will work with a core group of eight instructors from MCTC, Milwaukee School of Engineering, North Hennepin Community College, Southwest Minnesota State University, the University of Wisconsin-Stout, and Wartburg College to pilot, revise, and publish a set of activities based on those developed at the workshop. Evaluation of the project will involve interviews with the focal instructors, classroom observation, and student feedback to gauge the impact of this instructional change. The final version of these activities will be made available to others across the country, and results will be presented at the 2013 Human Anatomy and Physiology Society national conference alongside a workshop to introduce other instructors to POGIL. (Barton College.)

In the Spotlight Stephanie Katz *Linden Hall, Lititz, PA*

Stephanie Katz isn't one to bask in accolades. Recently recognized as one of the top chemistry teachers in Pennsylvania, Katz admits "when you get an award for doing something you love, it feels very strange."

The recipient of the 2011 Whalen Award for Outstanding High School Chemistry Teaching, Katz was recognized by the Southeastern PA Section of the American Chemical Society for her interest in professional development, activity in the field, advocacy for students, passion for the subject, and student outcomes. Katz teaches chemistry at Linden Hall in Lititz, PA, a highly competitive girls school attracting students from across the nation and 16 countries.



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"My students are phenomenally accomplished young people," she says. While she enjoys research "when it's going well," her true passion is teaching. "I love reaching my students, seeing light bulbs go off in their heads," she says. Her students consistently have a 100% passing rate for AP Chemistry, and in 2005, all of her students achieved 5s on the exam. Employing POGIL methods in the classroom helps facilitate their success.

Eager to further hone her award-winning teaching skills, Katz attends many workshops and conferences across the county, which is where she first discovered POGIL. "I like educating myself how to be a better teacher," says the 20-year classroom veteran. "Even though my Ph.D. was in research, teaching was a calling." She earned her Ph.D. from the University of Colorado at Boulder and her B.A. from Franklin & Marshall.

Katz says she modeled her teaching "after my fantastic teachers in college" including POGIL pioneers Rick Moog and Jim Spencer.

"We know that lectures only reach 5–10 percent of students. Students need more. They learn through inquiry and discovery," she says. "When you have 20 kids in your classroom you have 20 different types of learners. There is no one right way to teach to all of them, the only wrong way is to do the same thing every day. I constantly take into account all the different ways of learning when I teach."

Katz started using POGIL methods in her classroom, modifying college-level activities to work with her high school students. She was later selected as one of the 24 high school teachers nationwide to write, edit, and field test materials for the POGIL High School Partner Initiative (HSPI) project.

"It's great to be on the ground floor of writing and editing and field testing the curriculum," she says. "Instead of reaching 100 students a year, I have the opportunity to reach 3,000 in a global way. It makes me really proud."

Active in educational research as a consultant, she's co-authored an extensive number of publications. She's also been listed in Who's Who Among America's Teachers. She has served as a reader for the AP tests for several years. "I'm thrilled to be an AP reader. It was a career goal for me," she says. "It's great to be around people who are like me, people who get me. It's rare to find others with the same passion for sciences

—Daina Savage

Creegan Honored at POGIL National Meeting



Veteran POGIL practitioner, author and all-around great guy Frank Creegan of Washington College (left) was recently honored at June's POGIL National Meeting on the occasion of his retirement.

Creegan, who was one of the original co-PIs on the first NSF grant that initiated the POGIL Project, was presented with a "POGIL Chair" — in actuality, a Washington College captain's chair — in recognition of his years of service and dedication to the project. Creegan was the force behind the development of the POGIL laboratory materials, which was an outgrowth of his participation and leadership in the Mid-Atlantic Discovery Chemistry Project (MADCP).

In his remarks to the crowd, Project Director Rick Moog (right) said that "unlike old soliders, Frank will not just fade away."

He added, "Although he is 'retired', I fully expect Frank to continue to make contributions to the POGIL Project... at least on the occasions when we can pry him out of his new, comfy chair!"

Teaching Medicinal Chemistry Using a Process-Oriented Guided Inquiry Approach

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Introduction: Over the past 20 years, faculty members who teach medicinal chemistry have worked to bring clinical relevance to their subject matter and maintain the field as a key component in the basic science curriculum of colleges of pharmacy¹. Integration of strategies such as case studies^{2,3,4,5}, computerized tutorials^{6,7,8,9}, and the concept of Structurally Based Therapeutic Evaluation^{10,11,12} have helped keep the field vibrant not only in regards to clinical relevance but also in compliance with current Accreditation Council on Pharmacy Education (APCE) standards regarding integration of active learning and critical thinking in the curriculum¹³. This manuscript describes the integration of Process Oriented Guided Inquiry Learning (POGIL) into the Doctor of Pharmacy curriculum via a one-semester medicinal chemistry course.

The Gatton College of Pharmacy at ETSU has defined twenty-nine (29) Learning Outcome Expectations that must be addressed in various points throughout the curriculum. A key "Learning Outcome Expectation" applicable to the medicinal chemistry course is as follows: "Apply basic knowledge and principles of pharmaceutical sciences, clinical sciences, and socio-behavioral sciences to engage in critical thinking and solve problems." The integration of POGIL-style exercises into the course was meant to address this outcome, specifically in regards to the process skills of critical thinking and problem solving. This modification in content delivery operated under a dual-hypothesis model. The primary hypothesis was that the integration of POGIL-style exercises would result in equivalent outcomes on the standard multiple-choice exams. The secondary hypothesis was that students would prefer the student-centered classroom over an instructor-centered classroom due to the better and more extensive development of process skills as mandated by the College's "Learning Outcome Expectations". The goal of incorporating these POGIL-style exercises into the course was ultimately to improve the quality of the content delivery, including the quality of the student's experience with the content, without sacrificing the depth of the content.

Design. Students in the Fall 2007 section of Medicinal Chemistry (PMSC 4124) were taught in a traditional teacher-centered manner with the majority of class time spent on lecture with the occasional practice question set. Students in the Fall 2008 and 2009 sections of PMSC 4124 spent approximately 40% of their class time in structured self-selected teams where they worked through guided-inquiry exercises to supplement the lecture material. Average examination scores from each group were compared.

Assessment. Students in the guided-inquiry sections (Fall 2008 and 2009) outperformed their Fall 2007 counterparts by almost three percentage points on the overall exam average for the course. This proved to be statistically significant ($P < 0.05$) using an unpaired student's t-test. Furthermore, the grade

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distribution shifted from a B–C centered distribution (Fall 2007) to one that was A–B centered (Fall 2008 and 2009).

Discussion: Students who participated in the more student-centered learning environment via the team-based guided inquiry exercises outperformed those who did not on conventional multiple-choice exams. While the differences between the groups (Fall 2007 versus Fall 2008 and Fall 2007 versus Fall 2009) was not overwhelming, it was indeed statistically significant and ultimately resulted in a shift of the grade distribution from one that was B–C centered (Fall 2007) to ones that were A–B centered (Fall 2008 and 2009). To truly appreciate this grade distribution shift, one must also consider the high competency level of these students. As professional school students, they underwent a rigorous admissions process that resulted in three groups that possessed no statistically significant differences in PCAT composites and GPAs. Nevertheless, they showed differences in medicinal chemistry content mastery dependant on how the material was delivered. Because they were allowed to practice skills such as communication, teamwork, critical thinking, and problem solving while working in the group setting, one could argue that the Fall 2008 and Fall 2009 students better achieved one of the Gatton College of Pharmacy's key "Learning Outcomes Expectations". Furthermore, students were extremely satisfied with the incorporation of the team-based guided-inquiry learning, stating in their summative evaluations that they felt comfortable and confident with an historically difficult and abstract subject matter. Frequent small group interactions with materials that were turned in for evaluation by the faculty member also allowed for more regular assessment of content mastery, providing the opportunity for necessary clarifications before a high stakes exam was administered. This type of intervention based on frequent student feedback, as well as the process of facilitation of the small-group exercises, provided multiple opportunities for quality student-instructor interactions that would not have been possible in a traditional lecture-style classroom.

While exam scores and student satisfaction data point to the positive impact of the incorporation of team-based guided-inquiry exercises into this medicinal chemistry course, certain factors regarding the groups being compared must be considered. The Fall 2007 group was the first class of entering students into the Gatton College of Pharmacy at ETSU, and thus had the fate of a compressed first year. These students started in January 2007 and finished the first year by August 2007. They started their second year in September 2007, ultimately leaving the first semester of their second year compressed as well. The stress of this compressed schedule and the reduction in actual hours spent in the PMSC 4124 course could have contributed to their decreased exam performance.

In addition, the Fall 2007 was the first time the medicinal chemistry course was taught, and each iteration of the course is presumably improved in terms of content delivery. Also, the later groups of students knew what to expect from the course, which could have given them an advantage; however, very effort was made to reduce the impact of old exams being passed from one student group to the next. Exams results

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were only viewed under the supervision of the instructor, and the exams were not posted or returned to the students. Furthermore, the A–B centered grade distribution could have been a contributing factor to the high student satisfaction in the Fall 2008 and 2009 groups. This is not to imply that the Fall 2007 group had low student satisfaction; in fact this group awarded the medicinal chemistry instructor with an “Outstanding Teacher” award for that year.

Conclusions. The inclusion of the POGIL style team based learning exercises improved grade outcomes for the students, encouraged active engagement with the material during class time, provided immediate feedback to the instructor regarding student–knowledge deficiencies, and created a classroom environment that was well received by the students.

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POGIL in the News

- Check out a 3-minute video and experience being in a high school chemistry class where POGIL is used as the instructional model. The video was filmed by students at Bellevue Christian School, Clyde Hill WA. and features Mare Sullivan. <http://www.youtube.com/watch?v=EyLeJ5jmtK8>
- HSPI Partner Bruce Wellman, chemistry/material science and engineering design teacher at Olathe Northwest HS in Kansas was named a Teaching Ambassador Fellow by the U.S. Department of Education.
- Get all the latest news about POGIL by following us on Twitter! Sign up to get our @POGIL tweets at twitter.com.



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

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