Overview

I. Introduction
II. Sample POGIL Activity
III. POGIL Concepts & History
IV. Our Experiences
V. Using POGIL in the Classroom
VI. Discussion

* All URLs repeated on last slide.

POGIL – Process Oriented Guided Inquiry Learning
- HOW students learn is as important as WHAT they learn

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POGIL – Process Oriented Guided Inquiry Learning
- Students work in groups
- Activities use Learning Cycle paradigm
- Students construct knowledge
- Students teach/discuss/learn from students
- Instructors facilitate learning
Sample POGIL Activity

1. Form teams of 3-4 people.
2. Fill out header of meeting minutes.
3. Start working through activity.
   (expanded copy is available on request)
4. Raise hand if you have doubts, questions, or meta-questions.

POGIL – Process Oriented Guided Inquiry **LEARNING**

**Student**

- teaching-centered → learning-centered
  - Wait passively for direction & information
  - All arrive to same conclusion using same process
  - Actively construct knowledge
  - Gather and evaluate information
  - Explore, discover, create unique solutions

**Professor**

- teaching-centered → learning-centered
  - Content expert
  - Directly disseminates information
  - Source for all answers
  - Total control of class
  - Expert guide in the learning process
  - Provides resources, organization, clear learning objectives
  - Supporter, coach, collaborator

POGIL History

- David Hanson, Stony Brook University, 1994
- Originally in chemistry, spreading elsewhere
- Series of 20+ NSF grants
- Regular training workshops
- Useful resources & active community: http://www.pogil.org

POGIL – Proven Effective

Data from multiple experiments:
- Lower student attrition
- Improved mastery of content
- Improved learning skills
- Better attitude & motivation

Available at www.CSPOGIL.org
Grades Earned – General Chemistry at Franklin & Marshall College

- 8 years of data (n = 905)
- Data from classrooms of Moog, Farrell and Spencer
- 24 students / section


Final Exam Grades – Organic Chemistry at a Large Public University

- LECTURE n = 109
- POGIL n = 75

Withdrawals and Common Final Exam Scores - Fall 2000

Retention of Learning – Organic Chemistry at Large Public University

- Lecture vs. POGIL Organic I
- Organic 2 Pre-quiz Results

Where POGIL Has Been Used

- Large universities with hundreds of students
- Small liberal arts colleges
- High schools
- Graduate programs

How We’ve Used POGIL

- Scientific Computing
- Soft Computing (graduate course)
- CS 2
- Software Engineering
- An activity for one class period in other classes

Scientific Computing

- CS 1 for science majors
- Team taught with chemistry faculty
- Taught in Python, < 20 students
- POGIL activity in every class
- 2 hours classes, twice a week

<table>
<thead>
<tr>
<th>Scientific Context</th>
<th>Computational Focus</th>
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<tbody>
<tr>
<td>Unit conversions</td>
<td>Introduction to python</td>
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<td>Coordinate systems</td>
<td>Writing functions</td>
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<td>Newton's method</td>
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<td>File input/output</td>
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<td>Molecular Modeling</td>
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Scientific Computing

- Every activity includes a pre-activity due at the start of class
- Groups of 2-3 students
- Each activity consists of models with programming examples, critical thinking questions, and programming exercises
- Some team homework
- Some individual homework

Soft Computing (in India)

- 2009-2010 Fulbright-Nehru Scholar, India
- ~18 master’s students
- POGIL was a radical change from lectures
  - Skeptical, then enthusiastic
  - Activities presented using PowerPoint
  - Less paper, more flexible, manage pace & ”reveal”
  - Fluent in English, prefer local language(s)
  - POGIL reduced language barriers

CS2 (Java), Software Engineering

- POGIL used in ~1/3 of class meetings
- Mixture of activity formats
  - Paper handouts, presentation slides, etc
  - Small classes, less formal processes
  - Encourages students to collaborate
  - Extra motivation for 8AM classes
  - Revised activities available at cspogil.org

Tips on Using POGIL

- Facilitation is harder than it looks!
- Attend a POGIL workshop.
- Start small & simple
  - Experiment with existing activities
  - Try one POGIL activity
- Take notes on what you do, and where teams succeed or struggle.
- Limit grading – don’t try to do too much!

Use POGIL as Little as Once

Compilers course:
- One POGIL activity on graph coloring
- Students first experimented with a short expression and small number of registers
- Built up to graph coloring approximation algorithm
- No programming in activity
POGIL at a Large Public University
- Retain all lectures but convert recitations with POGIL sessions
- Replace one lecture/week with a POGIL session
- Replace all lectures with POGIL sessions
  - Start with quiz on last session’s material
  - Follow-up with overview of previous class

Guided Inquiry for High Schools
- Exploring CS course for 10-12 graders
- Not POGIL, but similar emphasis on guided inquiry
- Entire curriculum available at:
  http://www.exploringCS.org/curriculum
- Each day’s lesson includes objectives, teaching strategies, and supplemental resources.

Regional Workshops
- July 10-12, 2012:
  - Hamden, Connecticut
  - Seattle, Washington
  - Richardson, Texas
  - Salt Lake City, Utah
- July 23-25, 2012:
  - St. Paul, Minnesota
  - Greensboro, NC

Resources
- www.POGIL.org
  - Instructor’s Guide to POGIL
  - H5P Implementation Guide
- www.CSpogil.org
  - CS 1, CS 2, Software Engineering activities
- www.exploringCS.org
- Sign-up sheet to be added to mailing list
- Email us:
  - hhu@westminstercollege.edu
  - clif@kussmaul.org