Using POGIL in the Chemistry Classroom
Objectives, Practices, and Outcomes

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Our POGIL Experience

- Studied Chemistry and education at Stony Brook University using POGIL activities.
- Using POGIL activities 12+ years each.
- Trained to become certified POGIL facilitators, Jan 2017
- Attended POGIL NCAPP, June 2017
- Facilitated POGIL NE Regional Meeting, July 2017
- Presented POGIL at Chem Ed, July 2017
- Facilitated numerous regional workshops
- Invited to PNM, June 2018
The POGIL Project

• Launched in 2003 using NSF grants, non profit in 2010
• The mission is to connect and support educators from all disciplines interested in implementing, improving, and studying student-centered pedagogies and learning environments.
• Provides professional development for high school and college teachers at more than 20 workshops per year including regional and national meetings.
• www.POGIL.org
# What is POGIL?

**PROCESS-ORIENTED**
- Cooperative Learning
- Developing Process Skills
  - Communication
  - Team work
  - Problem Solving...

**GUIDED-INQUIRY LEARNING**
- Constructivism
- Active Participation
- Learning Cycle:
  - Explore
  - Invent
  - Apply
Retention Rates

Source: National Training Laboratories, Bethel, Maine
Major Facets

• Students work in groups
• Students construct knowledge
• Students teach, discuss and learn from other students
• Instructors facilitate learning
Aligns with NGSS

Science and Engineering Practice: Developing and Using Models

In POGIL activities students use models as tools for constructing new knowledge. These tools can include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.

Student Buy-In

- Job Listings Activity
- Working through first activity together slowly
- Modeling good team dynamics
- Students list expectations of an effective team
- Learning versus studying
Are roles important for a good team dynamic?

What roles do you use in your class?
Group versus Team

- A group is a collection of individuals who coordinate their individual work.
- A team is a number of individuals working together interdependently on a common goal.
- How can you observe the difference in the classroom?
- Which will be better for POGIL activities?
- How can we ensure students will work in teams?
Many teachers don’t utilize or enforce the roles used during POGIL activities which results in group work over team work.

When each student is assigned a role in their team they are forced to work more interdependently.
# KnowYourRole

1. Makes sure the team starts quickly and remains focused.
   a. Assigns tasks for collecting and distributing materials.
   b. Assigns calculations if multiple calculations are required.
2. Manages class time.
   a. Keep team moving forward.
   b. Communicates deadlines with the team.
3. Make sure all voices are heard and final answers are agreed upon.
   a. Makes sure every team member contributes to the activity.
   b. Ensures team has come to agreement and the final answers are complete on everyone’s activity handout.

# Analyst

- (Name) is providing excellent insights and explanations.
- "Would you agree that --- is a good answer for question ---?"
- "Could you please rephrase what you just said?"
- "Does that answer make sense to everyone in the group?"
- "Let's go back and revise our answer to question ---."
- "If another team reads this, will they understand our answer?"
- "Let's stop a minute, I have suggestions about how we can be more productive."
- "How can we improve our team work?"
- "Let's wait a minute for everyone to catch up before we move on."

# Provide positive feedback to their team while working.
1. a. Motivates team members.
2. b. Makes sure everyone is patient and respectful with one another.
2. Guides consensus-building process: team must agree on responses to the questions.
3. Analyzes why the team may get off task.
   a. Discusses problems with the team’s communication.
   b. Reports problems about the team behaviors to the manager.
4. Reflects with the group: At the end of an activity, discusses and assesses the team’s skills using the rubrics.
Manager

Makes sure the team starts quickly and remains focused.
- Assigns tasks for collecting and distributing materials.
- Assigns calculations if multiple calculations are required.

Manages class time.
- Keep team moving forward.
- Communicates deadlines with the team.

Make sure all voices are heard and final answers are agreed upon.
- Makes sure every team member contributes to the activity.
- Ensures team has come to agreement and the final answers are complete on everyone’s activity handout.
**Analyst**

Provides positive feedback to their team while working.
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Guides consensus-building process; team must agree on responses to the questions.

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- Discusses problems with the team’s communication.
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Reflects with the group: At the end of an activity, discusses and assesses the team’s skills using the rubrics.
Ambassador

Records team’s answers on the assignment provided. Ensures everyone recorded their own name on the paper to be handed in.

Communicates team’s questions and problems to the teacher:
- Calls the teacher for questions about the assignment.
- Calls for checks at the STOP SIGNS.
- Explains problems the team is having to the teacher.

Presents answers to the class and hands in assignment.
- Records answers on white boards, clickers, computers, etc.
- Reports out answers if the team is called on.
- Travels to other teams when team trading begins.
- Ensures the answers are handed in at the end of class.
Reader

Reads all passages, models, and questions on the activity.

If the activity is long, may assign passages to other members.

Rechecks the answers for appropriate significant figures and units.
Roles Summarized

There are no set of roles that are perfect for every classroom. Find the roles that works for you. Determine how those roles will be assigned and evaluated.
Team Formation

- Consider heterogeneous versus homogeneous teams.
  - Gender
  - Math skills
  - Communication skills
  - Information processing skills
  - Content knowledge
- Try to avoid placing your weakest performers with your strongest.
- Shuffle roles and teams. Consider the following:
  - Shuffle roles each POGIL activity so each student can develop each skill.
  - Shuffle teams 4-8 times a year to give each team time to set a team dynamic, but also so each student has time to work with most other students.
POGIL Frequency

- Find the activities that work best with the topic you are trying to teach. Don’t force an activity in if it doesn’t work for your unit just to have a POGIL activity that week.

- Consider using the POGIL and an inquiry activity, before any direct instruction.

- Find balance:
  - You don’t have to use POGIL activities every lesson.
  - If you don’t do them often enough, teams may suffer.
So the students are working hard! What does the teacher do?

This is the difficult part: **FACILITATE**!

- Circulate from team to team to listen to their communication and answers.
  - Use a clipboard to keep track of good examples of team work and good responses.
- Moderate any disputes between team members.
- Don’t give away answers:
  - Ask more questions
  - Refer to the model
  - Go back to previous questions and have students explain their answers.
Classroom Facilitation

Implementing an Activity

- Identify content knowledge goals
- Identify process skill goals
- Select/write activity
- Plan how to promote process & content skill development through facilitation
- Plan how to keep students making progress
- Plan how to bring closure to the class session
Evaluation

- Teams report out
- Hand in one activity sheet per team
- Team reflections
- Team or individual mini quizzes
Reporting Out Strategies

- Google docs
- Clickers/plickers
- Cards
- Post its
- Ambassador
<table>
<thead>
<tr>
<th>Process Skills</th>
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| **ORAL & WRITTEN COMMUNICATION** | *Oral Communication*: Exchanging information and understanding through speaking, listening, and non-verbal behaviors.  
*Written Communication*: Conveying information and understanding to an intended audience through written materials (paper, electronic, etc.). |
| **TEAMWORK** | Interacting with others and building on each other’s individual strengths and skills, working towards a common goal. |
| **PROBLEM SOLVING** | Identifying, planning, and executing a strategy that goes beyond routine action to find a solution to a situation or question. |
| **CRITICAL THINKING** | Analyzing, evaluating, or synthesizing relevant information to form an argument or reach a conclusion supported with evidence. |
| **MANAGEMENT** | Planning, organizing, directing, and coordinating one’s own and others’ efforts to accomplish a goal. |
| **INFORMATION PROCESSING** | Evaluating, interpreting, manipulating, or transforming information. |
| **ASSESSMENT** (Self Assessment and Metacognition) | *Self and Peer Assessment*: Gathering information and reflecting on experiences to improve subsequent learning and performance.  
*Metacognition*: Thinking/reflecting about one’s thinking and how one learns, and being aware of one’s knowledge. |
Process Skills

• How do instructors observe these process skills?
• Do students need to be aware of process skills?
  • Should they care?
• How do students reflect on their own process skills?
Process Skills
Rubric

- Communication
  - Speaks clearly, confidently, and with appropriate eye-contact with audience.
  - Applies active listening skills using reflection and questioning.
- Teamwork
  - Treats others honestly, fairly and courteously.
  - Manages conflict respectfully while maintaining progress toward a goal.
  - Encourages others to participate in group discussion.
- Management
  - Contributes to productivity of the group by staying on task.
  - Fulfills group role effectively.
- Info Processing
  - Obtains information from Models and other resources accurately.
- Problem Solving
  - Uses newly learned knowledge and skills to complete specific tasks.
  - Shows persistence in finding the answer to a problem.
  - Asks questions to strengthen understanding.
- Critical Thinking
  - Analyzes information through summarization, finding trends, comparing, etc.
  - Exhibits “outside of the box” thinking.
- Assessment
  - Accepts feedback and attempts to learn from mistakes or misunderstandings.
  - Reflects on own understanding and determines how confident they are.
## Teamwork

Interacting with others and building on each other’s individual strengths and skills, working toward a common goal.

Any score from 0-5 may be given, where 0 is “not observed”. Not all descriptors are necessary for the process skill to be scored.

Group members: ____________________________

<table>
<thead>
<tr>
<th>Category</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) INTERACTIONS</td>
<td>A. Engage in infrequent interactions or communications among group members.</td>
<td>A. Engage in sporadic interactions or communications among all group members.</td>
<td>A. Engage in continuous interactions or communications among all group members.</td>
<td></td>
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</tr>
<tr>
<td>(B) CONTRIBUTIONS</td>
<td>B. Consider contributions, strengths and skills of few group members. A single individual dominates.</td>
<td>B. Consider contributions, strengths and skills of most group members.</td>
<td>B. Consider contributions, strengths and skills of all group members.</td>
<td></td>
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</tr>
<tr>
<td>(C) PROGRESS</td>
<td>C. Make little progress towards a common goal, rarely on task.</td>
<td>C. Make moderate progress towards a common goal, mostly on task.</td>
<td>C. Make steady progress towards a common goal, completely on task.</td>
<td></td>
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</tr>
<tr>
<td>(D) COHESIVENESS</td>
<td>D. Minimally unite and function as a cohesive unit.</td>
<td>D. Partially unite and function as a cohesive unit.</td>
<td>D. Effectively unite and function as a cohesive unit.</td>
<td></td>
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</tr>
</tbody>
</table>
Teamwork

*Interacting with others and building on each other’s individual strengths and skills, working towards a common goal.*

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<tr>
<th></th>
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<th>5</th>
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</thead>
<tbody>
<tr>
<td><strong>Interaction</strong></td>
<td>Engage in infrequent interactions or communications among some of team members.</td>
<td>Engage in sporadic interactions or communications among most team members</td>
<td>Engage in continuous interactions or communications among all team members.</td>
<td></td>
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</tr>
<tr>
<td><strong>Contributions</strong></td>
<td>Consider contributions, strengths, and skills of few team members. A single individual dominates.</td>
<td>Consider contributions, strengths, and skills of most team members.</td>
<td>Consider contributions, strengths, and skills of all team members.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Progress</strong></td>
<td>Make little progress towards a common goal, rarely on task.</td>
<td>Make moderate progress towards a common goal, mostly on task.</td>
<td>Make steady progress towards a common goal, completely on task.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cohesiveness</strong></td>
<td>Minimally unite and function as a cohesive unit.</td>
<td>Partially unite and function as a cohesive unit.</td>
<td>Effectively unite and function as a cohesive unit.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Explain your best and worst aspects of teamwork:
POGIL Activities

Not all “POGIL” are created equally!

• Activities created by the POGIL project are field tested and modified for optimum implementation.

• The POGIL registered activities follow the explore, invent, apply model using specific questioning techniques.

• Find the activities that work the best for you, but always work through the activity before implementing it in class.
POGIL Workshops

Consider attending POGIL workshops with passionate and knowledgeable POGIL staff and implementers. You may:

• Meet amazing people with fresh ideas
• Learn how to improve facilitation techniques
• Learn how to write POGIL activities
• Obtain resources and activities
• Implement POGIL labs!

www.POGIL.org
POGIL Workshops

- **Northeast Regional**    July 10-12    Manhattan College, NY
- **Northwest Regional**   July 10-12    Univ. Puget Sound, WA
- **North Central Regional** July 16-18    Univ. Illinois, Chicago
- **South Central Regional** July 17-19    Univ. Texas, Dallas
Questions?
Contact Us!

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To complete a brief survey about this webinar, and to generate your certificate of attendance, visit:  http://bit.ly/AACT-PD

To Download Resources:  
http://bit.ly/PogilWebinar