

# Building Process Skills and Critical Thinking Through POGIL

A Guided Inquiry-Based Approach to Math

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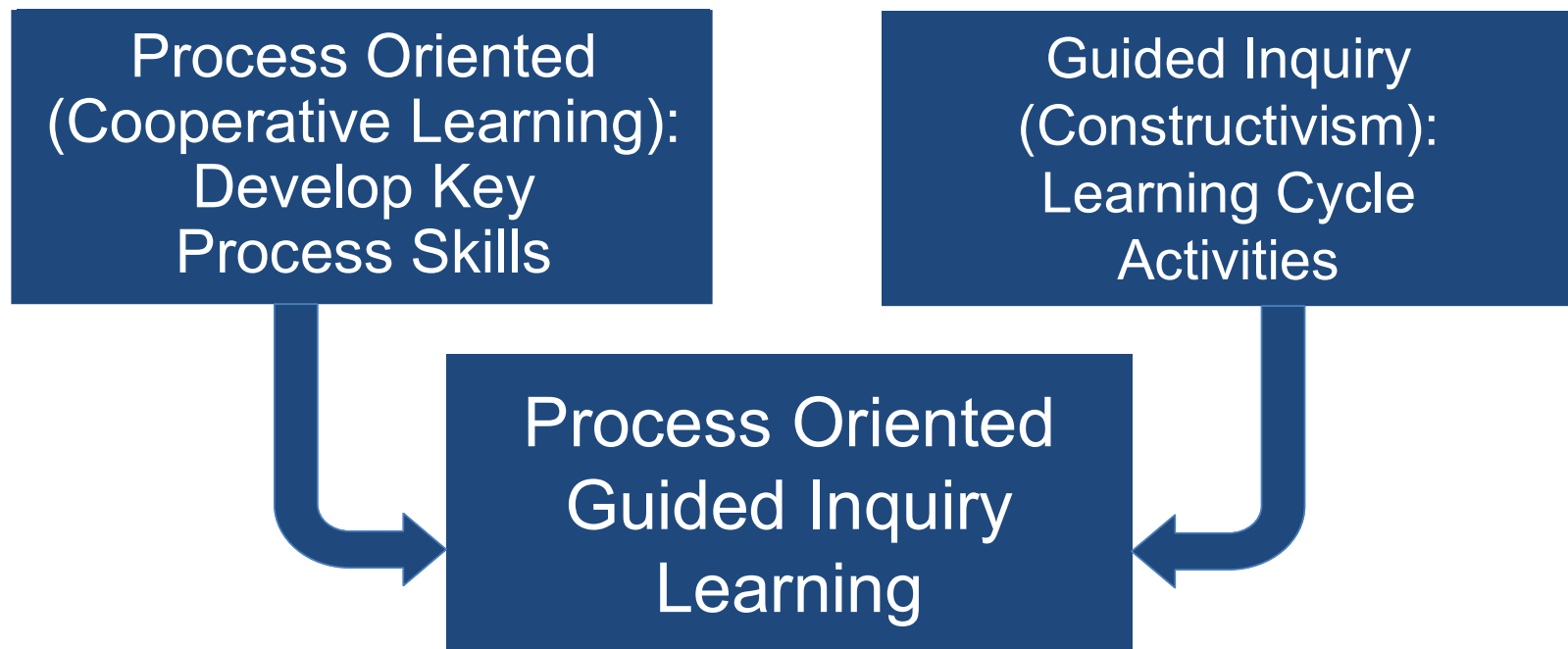
University of Pittsburgh at Greensburg – Mathematics

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# What is POGIL?

- Process-Oriented Guided Inquiry Learning (POGIL) is an active learning approach where students work in structured teams to explore concepts and construct knowledge through guided inquiry.
- Key Features:
  - ➡ Student-centered, team-based learning
  - ➡ Instructor as a facilitator, not a lecturer
  - ➡ Structured activities with exploration, concept invention, and application
  - ➡ Develops process-skills such as critical thinking, problem-solving, and communication skills

# What is POGIL?



# Job Ads Activity for Students

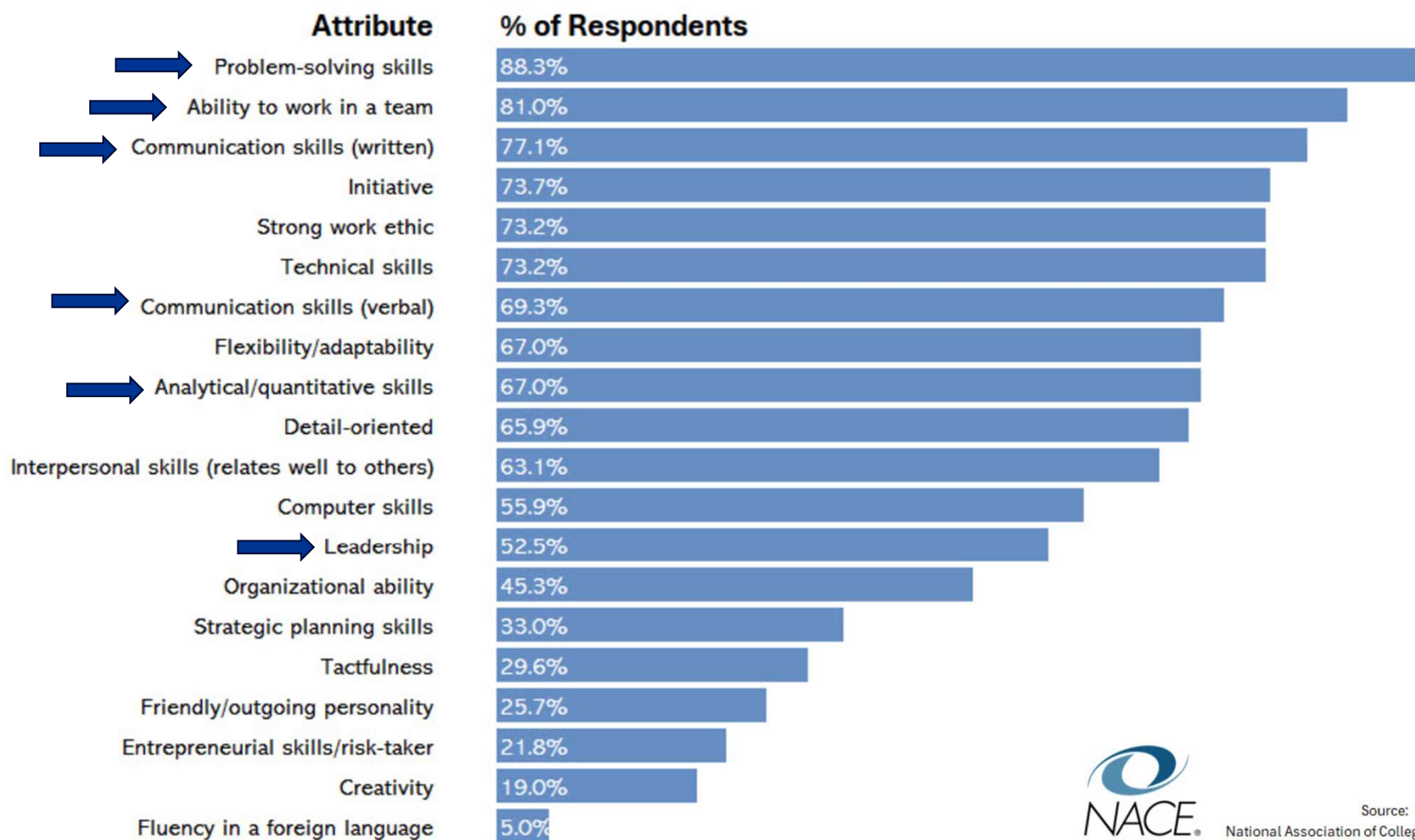
## Business Development Specialist

- Communicate and maintain a net positive business approach by carrying out sales targets.
- Resolve customer challenges to resolve escalations and issues to benefit all parties with corrective measures.
- Work jointly with the Sales Team to identify and grow opportunities within territories as directed and assigned.
- A strong ability to implement and promote growth strategies between the customer and E360S using account retention efforts.
- Communicate rates for services rendered as well as understand customer requirements while meeting appropriate profit targets.

## Criminal Justice Specialist

- Manages needs for those clients who are currently in County Prison or State Correctional Institutions and works with community providers, clerk of courts, public defender, etc. to work for the timely release of the individual.
- Advocates for medication routine and safety while inside the institution and provides referral assistance and linking to housing, entitlements, treatment and community activities upon release.
- Monitors and follows up with the individual at least bi-weekly, but in most circumstances, weekly. Educate the client on available resources and how to access them.

## Attributes Employers Seek on a Candidate's Resume



Source: Job Outlook 2025  
National Association of College and Employers



### 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 toward a common goal.



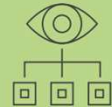
### Problem Solving

Analyzing a complex problem or situation, developing a viable strategy to address it, and executing that strategy (when appropriate).



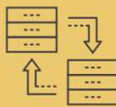
### Critical Thinking

Forming an argument or reaching a conclusion supported with evidence by evaluating, analyzing, and/or synthesizing relevant information.



### Management

Planning, organizing, directing, and coordinating one's own and others' efforts to accomplish a goal.



### Information Processing

Evaluating, interpreting, manipulating, or transforming information.



### Self + Peer Assessment

Gathering information and reflecting on experiences to improve subsequent learning and performance.



### Metacognition

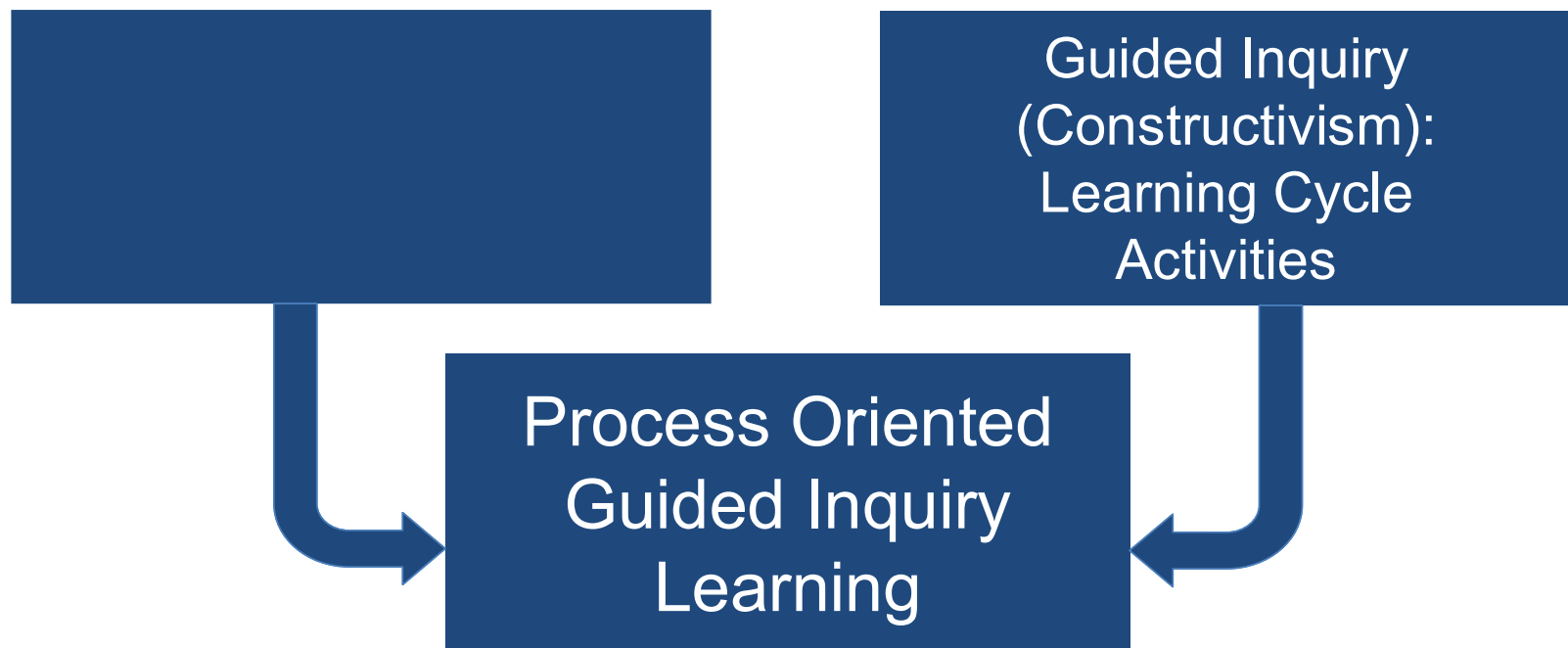
Being aware of and able to regulate one's thinking and knowledge.



**Learning is a  
process + a skill**

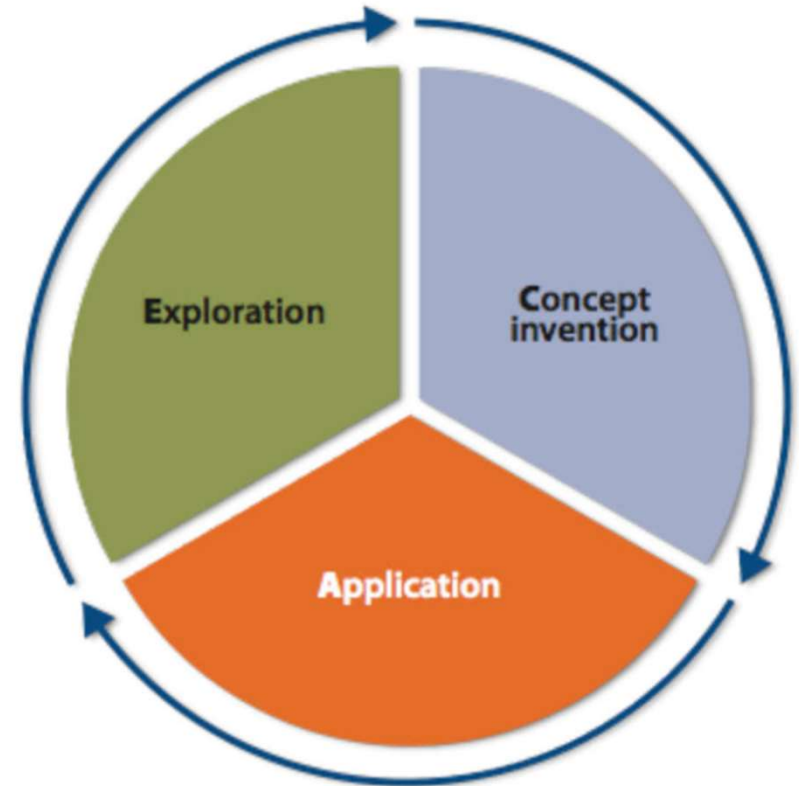


# What is POGIL?



# The Learning Cycle

- ★ The **Exploration (E)** questions direct and lead the students to interpret the details of the model.
- ★ The **Concept Invention (I)** questions are used for the construction of knowledge required for achieving the learning objectives and the development of the needed terminology.
- ★ The **Application (A)** questions allow the students to take the knowledge they have constructed and apply that knowledge to new and different situations.







# POGIL – Student Roles (Suggested)

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Role	Responsibilities
<b>Manager</b>	Initiates the conversation and guides the process to a successful conclusion. Keeps the team working toward a successful outcome.
<b>Presenter</b>	Communicates for the team to the facilitator and the larger group.
<b>Recorder</b>	Documents the results of the team's work.
<b>Reflector</b>	Observes the teamwork. Comments on the behaviors that were beneficial and what might need improvement.

# POGIL – Student Roles

Role	Responsibilities
<b>Captain</b>	Manages the team and the time. Ensures that members are fulfilling roles, that the assigned tasks are being accomplished on time, and that all members of the learning team participate in activities and understand the concepts. Checks in that the recorder submitted on time.
<b>Reader</b>	Reads aloud the questions. Ensures that the group is not working in silence.
<b>Recorder</b>	Records the important aspects of the learning team's discussions, observations, insights, etc. The recorder is responsible for submitting the POGIL activity for grading.
<b>Speaker</b>	Communicates for the team. Ensures that everyone in the team agrees on what to ask if an outside source is needed. Presents conclusions of the team to the class, as requested. This is the only person that can ask the instructor a question.

# Examine a POGIL Model & Questions

- Go to the drive:  
<https://drive.google.com/drive/u/1/folders/1clHg4skVvifCSMKGAac1E-5X-5DrKruc>
- When you enter your breakout rooms, assign each team member a role by birth month.
  - Manager (closest to January) – keep track of time and lead the team
  - Recorder – keep track of team's thoughts
  - Reflector – pay attention to team dynamics
  - Speaker (closest to December) – be prepared to share out when we return
- As a team, decide which activity you would prefer to look at – Operations with Polynomials (Algebra) or Parametric Equations (Calc 2)



# Examine a POGIL Model & Questions

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- Learning Cycle:
  - Classify each Question as Exploration (E), Concept Invention (I), Application (A), or Other (O).
- Process Skills:
  - Identify ONE or TWO Process Skills that your team believes the activity is trying to build towards. Are specific questions building towards certain skills?

When we return, we will share out some of the thoughts/findings.



# How is POGIL Different From Other IBL?

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- Highly Structured – activities are explicitly scaffolded
- Learning Cycle – designed around *explore* – *invent* – *apply* phases
- Roles in Groups – explicit team roles
- Focus on Process Skills – process skills are a co-equal learning objective with content
- Materials – professionally developed, tested and refined, and endorsed activities.



# The POGIL Project

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The mission of The POGIL Project is to improve teaching and learning by fostering an inclusive, transformative community of reflective educators who design, implement, assess, and study learner-centered environments.

A few facts:

- Non-profit 501(c)(3)
- International organization
- Includes secondary & post-secondary educators
- Initial funding from the NSF (2003-2012) and other grants
- Currently funded by workshop fees, sales of materials, and private donations
- Executive Director – Rick Moog (Franklin & Marshall College, retired)



# Strategies that have worked for me...

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- Introductory activity – NOT math related
- Do an activity as a class
- Do not change groups unless requested or needed
- Rotate roles/let students select initial role
- Cup stacking/cards for monitoring questions/progress
- Students submit activities for grades - Gradescope
- Using a hybrid model – mixture of lecture and POGIL
- Give it time – students need to adjust and buy in to the process
- Mini-lecture recordings as supplemental (especially for absences)



Interested in  
Learning  
More?

<https://pogil.org/>

1-day Virtual Fundamentals of POGIL  
Custom Workshop  
(department, school, or region)

3-day Summer Workshop  
Fundamentals of POGIL  
Classroom Facilitation, Activity Writing or Lab Track

Practitioners Facebook page  
Podcasts  
e-Series and webinars  
Pop-ins  
Social hours  
POGIL Activity Clearinghouse  
Learning Communities  
National Conference to Advance POGIL Practice  
(NCAPP)





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