OBJECTIVES:

By the end of this session you will be able to...

1. Explain the basics of Inquiry Based Learning (IBL)

2. Explain and Apply the basics of the POGIL method of IBL
INQUIRY- BASED LEARNING
What is the goal of science education?
Pedagogical Strategies

Chalk and Talk:

• Traditional science education
• Focus on ‘what we know’ (facts)
• Direct transfer of knowledge from teacher to student (Sage)
• Teacher’s role = dispense knowledge
• Student’s role = receive knowledge
Research Findings:

• Understanding science is more than knowing facts.

• Students build knowledge on what they already know (preconceptions).

• Students generate/formulated new knowledge by modifying and refining their current concepts (misconceptions).
• Learning is mediated by a social environment in which learners interact with others.

• Effective learning requires that students take control of their own learning.

• The ability to apply knowledge to new situations (transfer of learning) is affected by the degree to which students learn with understanding.
Learning Pyramid

National Training Laboratories
Bethel, Maine 1-800-777-5227


Average Retention Rate

- Lecture: 5%
- Reading: 10%
- Audio-Visual: 20%
- Demonstration: 30%
- Discussion Group: 50%
- Practice by Doing: 75%
- Teach Others / Immediate Use: 90%

Traditional Passive
Teaming Active
Inquiry-Based Learning:

• Focus on Scientific Process.
• Explore “how we know what we know” (evidence & reasoning)
• Indirect transfer of knowledge:

  Teacher’s role = facilitator of learning

  Student’s role = active, independent learner (investigator)
Inquiry is something that students do, not something that is done to them.
If you tell me ......I might forget,

If you show me ......I will remember,

If you involve me ......I will understand.
WHAT IS INQUIRY?

- investigating
- observing
- analyzing
- interpreting data
- proposing explanations
- predicting
- concluding
- communicating
Types of Inquiry

- Open Inquiry: No predetermined question; students propose and pursue their own questions.

- Guided Inquiry: No predetermined method; students must determine how to investigate the problem.

- Structured Inquiry: No predetermined answer; conclusions based solely on student investigation.

- Limited Inquiry: "Traditional" labs; students follow the directions and make sure their results match those given in the text.
Levels of inquiry-based learning

- High teacher involvement:
  - 1. Confirmation inquiry: re-inforces prior knowledge
  - 2. Structured inquiry: student follows set process
  - 3. Guided inquiry: research question only provided
  - 4. Open/true inquiry: student does everything

- Low teacher involvement:
<table>
<thead>
<tr>
<th></th>
<th>Traditional Classroom</th>
<th>POGIL Classroom</th>
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<tbody>
<tr>
<td>Prof’s Job</td>
<td>Lecture</td>
<td>Help students learn</td>
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<td>Source of Material</td>
<td>Professor</td>
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<td>“Learning Cycle” Activities</td>
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<td>Student role</td>
<td>Passive listener</td>
<td>Active group discussion</td>
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<td>Learning</td>
<td>Memorize notes after class</td>
<td>Discover concepts during class, reinforce after class</td>
</tr>
<tr>
<td>Emphasis</td>
<td>Competition</td>
<td>Community, Co-operation</td>
</tr>
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Learning Cycle Activities

- Exploration
- Concept invention
- Application
Outcomes of the POGIL Method

- Students are actively engaged and thinking in class
- Students discover concepts (rather than memorize facts)
- Students learn course content & key process skills

Key Process Skills

- Information Processing
- Critical Thinking
- Problem Solving
- Communication
- Teamwork
- Management
- Self-assessment
CORE APPROACH:

Questions

Roles
GUIDED INQUIRY QUESTIONS
(CRITICAL THINKING)

• Directed Questions:
  Exploratory in nature. Easily answered with specifics from the activity.

• Convergent Questions:
  Focused on Concept Invention. Help generate new ideas from information and synthesis.

• Divergent Questions:
  Application focused. Help transfer knowledge to new situations.
ROLES

• Manager

• Recorder

• Presenter

• Reflector
CLASSROOM DISCOURSE ENVIRONMENT

• The classroom environment will be safe for students to express their ideas.

• Goals of classroom discussions will be anticipated by the instructor and made clear to students.

• The instructor and students will model interactions that foster critiques of unsupported ideas while encouraging the sharing of ideas and respect for those who are sharing.
CLASSROOM DISCOURSE ENVIRONMENT

• Focal questions and tasks will be predominantly for making sense of science ideas and phenomena.

• Allow sufficient time for thinking.

• Manage the initiation and development of ideas while at the same time honoring the thinking of all members of the team.
CLASSROOM DISCOURSE ENVIRONMENT

• Students’ puzzlements and ideas will be treated as resources for the learning of the whole class.

• Students’ language and forms of communication will be scaffolded from what they bring to class toward more academic ways of speaking.

• Meta-cognitive questions will be part of all lessons so that students learn to assess their own thinking and monitor progress toward longer term goals.
LET'S TRY IT OUT!

ACTIVITIES
“To support educators with the implementation of student-centered learning environments.”