Exploring Inquiry-Based Learning

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Introductions

- Name
- Teaching Level/Institution
- Experience with I.B.L.

What is I.B.L.? - Moore Method (Presentation Style)

- Inspired by the teaching method of R.L. Moore.
- Most often seen in upper-level undergraduate or graduate mathematics courses.
- Students are provided with definitions and theorems and prove the theorems without consulting outside sources.
- Student generate the mathematics
- Class time is devoted to students presenting/defending proofs to the entire class.

Modifications to the Moore Method include part time presentation, part time lecture; students provided with examples; students given guidance through the development of material.

What is I.B.L.? - Group Work Style

- Students are organized into groups (typically 3 or 4)
- Class time is devoted to students engaging in mathematical tasks
- Students are encouraged (prodded) to debate, discuss, disagree, and explore collaboratively
- Instructor visits with each group and nudges them along...when they need nudging
- Whole class discussions can be a central part of classroom culture

DAoM materials were written for a Group Work Style classroom dynamic.

I.B.L. Warm-up[1]

What is the picture for 36? 37?

If you're feeling adventurous, 300?

Be ready to share with the group anything you notice, your answers, and how you arrived at them. (What type of reasoning did you use?)

[1] Mathematical task from `https://www.youcubed.org/`

Discussion: What do you want for your students?

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- Enjoy engaging in mathematics
- See mathematics in a genuine way (no monkey-see, monkey-do, more than solving textbook questions,...)
- Grow their "meta-skills"
  - Oral Communication
  - Written Communication
  - Teamwork
  - Critical Thinking/Logical Reasoning
  - Perseverance
  - Sensemaking
  - Etc.
- Grow their mathematical confidence
- Understand mathematical content

Q: How does your classroom support your students achieving these outcomes?

Engaging in DAoM materials

Chapter 4 from Truth, Reasoning, Certainty, and Proof.

At WSU this book has been used for/in our classes MATH 110 Mathematical Explorations, MATH 116 First Year Seminar in Mathematics, MATH 220 Discrete Structures.

Lunch Homework

What role does your expertise play in your classroom?

What message does your classroom dynamic send to your students about mathematics?

HOMEWORK WILL NOT BE COLLECTED...PLEASE DO IT ANYWAY

Discussion: The role of your mathematical expertise in the classroom?

Discussion: The role of your mathematical expertise in the classroom?

- Careful choices of the tasks students engage in.
- What questions to ask individuals and/or groups?
- How to respond to student questions (for instance avoiding variants of "Is this right?" like a ninja.)
- Finding the right "nudge"

Role of Students in a Traditional Classroom

Role of Students in a Traditional Classroom

- Passive recorder of information; downstream in a one-way information channel
- Witness to a "well rehearsed" mathematical display
- Often more focused on taking impeccable notes than working to understand ideas presented
- Views the instructor as the expert (i.e. arbiter of correct and incorrect)

Role of Students in an IBL Classroom

Role of Students in an IBL Classroom

- Active participant in the mathematical work
- Forced to take ownership of their ideas, defending them from questions and critique from classmates and the instructor
- Free to find novel ways of answering questions (I don't want to let my knowledge get in the way of my students discovery.)
- Forced to take the lead in mathematical sense-making (instructor becomes a guide)

Engaging in DAoM materials

Chapter 3 from Games and Puzzles

At WSU this book has been used for/in our class MATH 110 Mathematical Explorations

Challenges of IBL

- Most students are conditions to traditional mathematics classrooms
- Too many students see mathematics as collections of rules and facts, they don't see the role of mathematical practice
- "When are you going to teach us?"
- "Cover" less material.

Overcoming the Challenges of IBL

- Talk to your students about the pedagogical decisions you're making, and why you are making them.
- Celebrate their successes
- Condition them to "roll with the punches" (mistakes are a natural part of learning)
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DAoM Materials and Other Resources

- DAoM Books: `http://www.artofmathematics.org/books`
- Academy of Inquiry-Based Learning: `http://www.inquirybasedlearning.org/`
- Journal of Inquiry-Based Learning: `http://www.jiblm.org/`
- NRICH: `http://nrich.maths.org/`
- Lots of Course/Topic Specific resources: `http://www.artofmathematics.org/resources`

Thank You!

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