IBL number theory

Lola Thompson

My flavor of IBL

IBL in large-ish classes

A model class period

The student perspective

What would I change?

IBL number theory (for large values of n)

Lola Thompson

Oberlin College

June 19, 2014

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The student perspective

What would I change?

- Class time is spent on group work and student presentations. No lectures!
- Groups are assigned (engineered) by me. They rotate every 2 weeks.
- Textbooks and internet resources are explicitly forbidden.
- I will give hints. The size of the hint is proportional to the amount of effort that the group has expended.
- During student presentations, I **will** interject if a proof has serious errors or if a conjecture is really off-base.

How I "sell" IBL to students and colleagues

IBL number theory

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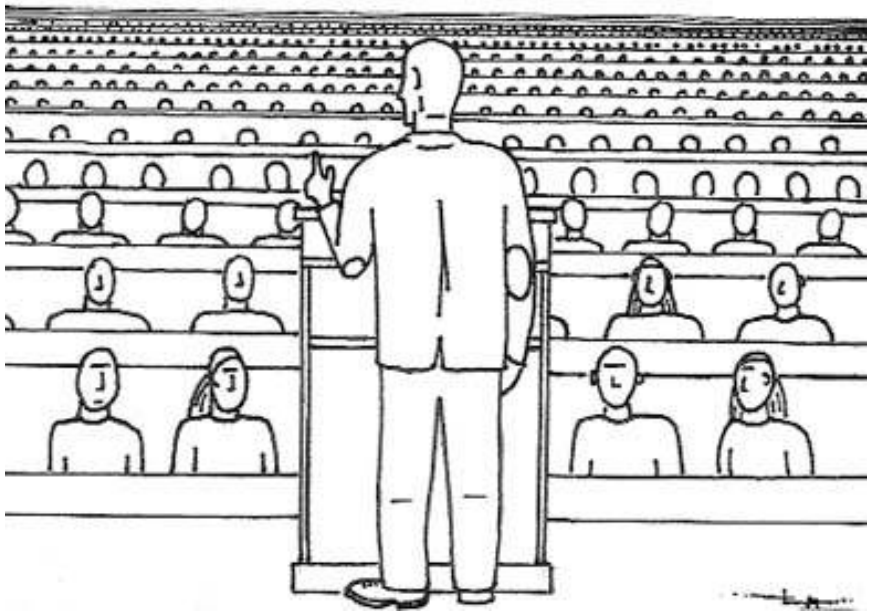
The student perspective

What would I change?

This course models what it is like to be a researcher in number theory:

- Students experience the research process. They perform computations, use the data to make conjectures and then try to prove their conjectures.
- Students work with one another as research collaborators.
- Students TeX up their work and submit a final textbook project. Projects are graded on both mathematical correctness and on the quality of exposition.
- Students are expected to attend an undergraduate-friendly research seminar in number theory while enrolled in the course.

IBL in large(ish) classes



Making sense of the title

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The student perspective

What would I change?

My expectations:

- Enrollment: 5-10 students (ok, maybe 12)
- Classroom: cozy seminar room

The reality:

- Enrollment: 24 students (21 enrolled + 3 auditors)
- Classroom: large (for Oberlin) lecture hall

Original plan

Monday	Wednesday	Friday
Presentations; HW due; return previous HW	Work on problems in groups of 3 in class	Work on problems in groups of 3 in class

Homework policy:
Students work on problem sets in groups during class but write up their solutions individually for homework. Each student turns in an individual textbook project at the end of the semester.

Class participation:
Each student is expected to present a problem at the board on a bi-weekly basis.

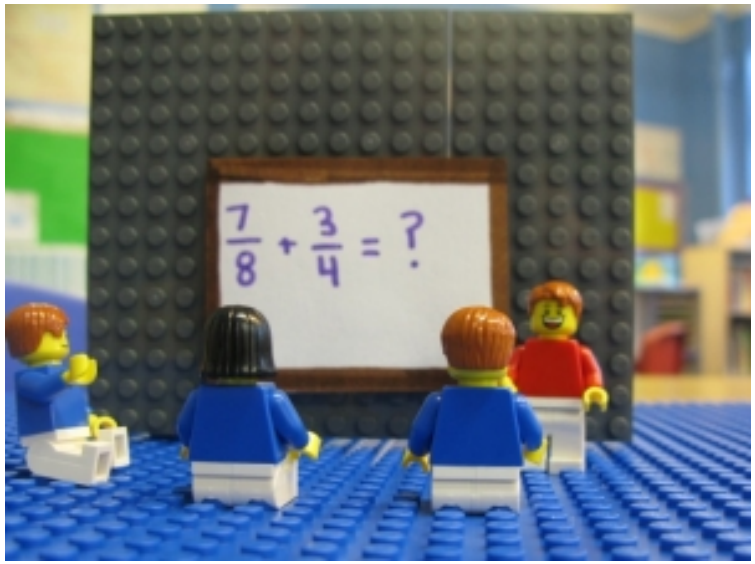
Adjusted plan

Monday	Wednesday	Friday
Presentations; HW due; return previous HW	Work on problems in groups of **3-5** in class	Work on problems in groups of **3-5** in class

Homework policy:
Students **collaborate** on writing up their homework each week using **ShareLaTeX.** Each student turns in an individual textbook project at the end of the semester.

Class participation:
Each student is expected to present a problem at the board **at least 5 times** over the course of the semester. In addition, students receive a grade for group participation.

A model class period



[Break for worksheets]

A model class period

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A model class period

The student perspective

What would I change?

Conjecture: If $n = 4$ then $(n-1)! = 6 \equiv 2 \pmod 4$. If $n \neq 4$ and n is composite then $(n-1)! \equiv 0 \pmod n$. If n is prime then $(n-1)! \equiv -1 \pmod n$ (Wilson's Theorem).

Where this is going...

A model class period

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IBL in large-ish classes

A model class period

The student perspective

What would I change?

Conjecture: If $n = 4$ then $(n-1)! = 6 \equiv 2 \pmod 4$. If $n \neq 4$ and n is composite then $(n-1)! \equiv 0 \pmod n$. If n is prime then $(n-1)! \equiv -1 \pmod n$ (Wilson's Theorem).

Where this is going...

From Set #9:

Prove or Disprove and Salvage if Possible

P1. For any integer n, $(n-1)! \equiv -1 \pmod n$.

Student feedback:

the good, the bad, and the ugly

Student feedback: negative

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A model class period

The student perspective

What would I change?

"I do not think the structure of the class was effective. Working in groups to discover the information through problem sets seems good, but **if the smarter people do the harder problems, then the others are not learning.** I do not feel like I know the material even though I have put a reasonable amount of time in, because **I only did approximately 1/3 of each assignment**. I think that **a standard lecture format would have resulted in much better overall understanding** of the material among all students."

Student feedback: mixed

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The student perspective

What would I change?

"I think it started out rocky because it's IBL and **there are definitely still a lot of issues with group members who don't do the work and inducing stress**, but the responses to feedback over the semester helped a great deal and this class is amazing."

Student feedback: positive

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The student perspective

What would I change?

"This was a really great class! I love IBL. I think **I learned more from this class than almost any class I have taken** at Oberlin and **I think I will actually remember it.**"

What would I change?

What would I change next time?

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IBL in large-ish classes

A model class period

The student perspective

What would I change?

Beg my Department to cap the class at 12!!!

What would I change next time?

IBL number theory

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IBL in large-ish classes

A model class period

The student perspective

What would I change?

Beg my Department to cap the class at 12!!!

More seriously:

What would I change next time?

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IBL in large-ish classes

A model class period

The student perspective

What would I change?

Beg my Department to cap the class at 12!!!

More seriously:

- Advertise the course as an IBL course at least one semester in advance.

What would I change next time?

IBL number theory
Lola Thompson
My flavor of IBL
IBL in large-ish classes
A model class period
The student perspective
What would I change?

Beg my Department to cap the class at 12!!!

More seriously:

- Advertise the course as an IBL course at least one semester in advance.
- Split the Monday presentations into two "lab" sections.

What would I change next time?

IBL number theory

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A model class period

The student perspective

What would I change?

Beg my Department to cap the class at 12!!!

More seriously:

- Advertise the course as an IBL course at least one semester in advance.
- Split the Monday presentations into two "lab" sections.
- Require students to fill out a biweekly self-assessment with space for (optional) feedback about group members.

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The student perspective

What would I change?

Thank you!