



Making undergraduate research work for you

Lola Thompson

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Recruiting students

Developing research skills

Finding the right problem

Structuring the research experience

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“I did it my way”: making undergraduate research work for you

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Max Planck Institute for Mathematics and Oberlin College

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Reasons NOT to mentor undergraduate research

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There are lots of reasons NOT to mentor undergraduate research:

- Desire to travel during the summer
- Concerns about managing a team of people with potential clashes in personality or working style
- Funding constraints
- Pressure to produce a publishable research paper in a limited amount of time
- Imposter syndrome (why would students even want to work with me???)



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Good news: there doesn't need to be a "one size fits all" model for undergraduate research!



I do it my way

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My workarounds:

- I don't mentor students over the summer – I work with them during the academic year, and work intensively with them during Oberlin's month-long Winter Term.
- I work one-on-one with students, rather than managing a team.
- Funding not essential when students work with me during the academic year (they get course credit).
- I typically work with my research students over the course of 1-2 years. We do produce publishable research, but in a very reasonable timeframe.
- I'm slowly gaining confidence in my abilities as an undergraduate research mentor with each new paper that I co-author with students!



Overview

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In this talk, I will discuss my approaches to the following aspects of undergraduate research:

- Recruiting students
- Developing research skills
- Finding the right problem
- Structuring the research experience
- Other components of mentorship
- Benefits to the faculty mentor



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Recruiting students

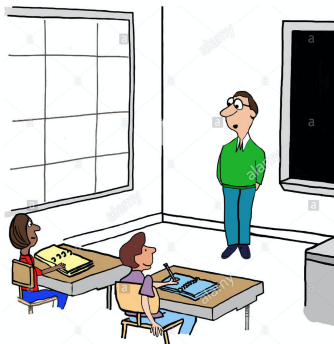
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“The STEM program has many advantages: you can invent stuff, you can use great equipment ... but's let's talk about the great cafeteria food.”

Recruiting students



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I mainly recruit research students from two courses that I regularly teach: Discrete Mathematics and Number Theory. I teach both courses using an inquiry-based learning (IBL) framework. In addition to gaining background related to my research, they develop:

- Confidence
- Persistence
- Creativity
- Independence
- Oral presentation skills



Max Planck Institute Summer Intern Program

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I have also mentored two high school students on research through the Max Planck Institute's Summer Intern Program.





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Developing research skills



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In every 200-level and 300-level course that I teach, I place a strong emphasis on mathematical writing. Some of the ways that I help them to develop strong writing skills:

- Peer-grading – students learn a great deal from reading one another's writing!
- Draft-and-revision process for certain assignments.
- Every homework assignment must be written in LaTeX. This encourages students to edit their proofs.



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Finding the right problem



Finding the right problem

I want my students to generate their own problems. How does this happen?

- Read papers together, and ask students to come up with natural follow-up questions.
- Keep a running list of good “starter” problems that come up in my own research. (“Starter” problems are breadcrumbs that will lead students to come up with more questions.)

Generating problems gives students ownership of their work, and helps them feel like true collaborators. They also know that I’m not giving them a “canned” project that I have already figured out!

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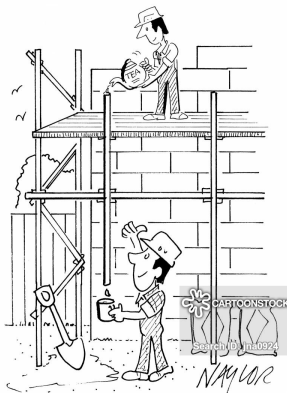
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Structuring the research experience



Structuring the research experience

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What does a typical week look like?

- Weekly one-hour meetings. I start and end each meeting by checking in with my students about their lives.
- Students are expected to send me a writeup of what they have been working on the night before we meet. The writeup can just be a summary of what they have thought about (including failed attempts) and any questions that have arisen. This helps to shape the direction of our meeting.
- At the end of each meeting, I give my students a “to do” list with some starred “high priority” items.
- I am forgiving if they have one or two really busy weeks where little is accomplished. After that, we have a talk.



Mistakes that I have made

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Warning: Do not expect to continue working on the paper after your student graduates. If at all possible, finish everything before they leave campus!



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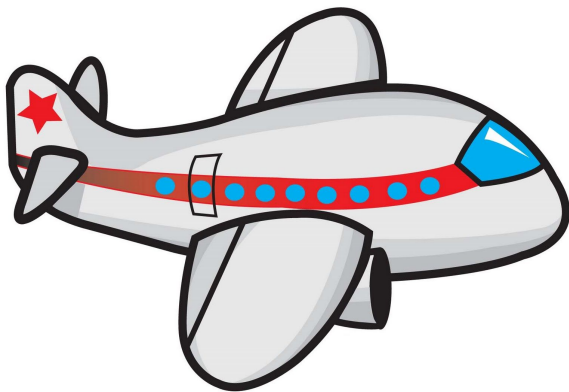
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Other components of mentorship



Other components of mentorship

Some other things that I do:

- I teach my students how to read research papers.
- I give my students a realistic picture of what it's like to pursue a career in academia.
- I help them develop a sense of mathematical taste.
- I speak with them about how to choose an appropriate journal, and then let them choose the journal that we submit our paper to.
- Whenever possible, I bring my students to number theory conferences with me. I give them advice on how to listen to research talks. I also help them with preparing their own talks (when appropriate).

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PARTING THOUGHTS





Parting thoughts

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Why mentor undergraduates? What's in it for you?

- Helps me step back from a subject that I know well, and recognize what others who are new to the subject find challenging. Benefits my expository writing!
- Provides an opportunity to broaden my knowledge by working on something adjacent to my usual research.
- Builds a community of future research collaborators.
- It's actually a lot of fun!



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Thank you!