MENTORING & MANAGING STUDENTS

Nancy M. Amato, University of Illinois at Urbana-Champaign

Lori Pollock, University of Delaware

FIRST, A BIT ABOUT US

FUN FACT

The very first CRA Career Mentoring Workshop was in 1993, organized by CRA-Women (now CRA-Widening Participation)

Attendees included some of your speakers today (and many others you would recognize!):

- Nancy Amato (grad student at UIUC)
- Lori Pollock (Assist Prof at Rice)
- Mary Hall (postdoc at Stanford)
- Sandhya Dwarkadas
- Margaret Martonosi

Nancy Amato, University of Illinois

PhD Illinois: MS Berkeley; BS Applied Math & AB Econ Stanford

Texas A&M (1994-2019): Asst, Assoc, Full, Emeritus (!)

(back at…) UIUC (since 2019): Prof and Dept Head

Research – Applied Algorithms

- Motion Planning, robotics, comp biology & geometry
- Parallel & distributed computing

Research Group

- 2 postdocs, 12 PhD, 2 MS, 4 ugrads (+ open source team)
- Graduated 29 PhDs (13 profs, 9 research labs, 6 industry, 1 postdoc)

Other Stuff

- Bernese Mountain dogs – currently Fred & Wilma
- highlights: bucket trip to Machu Picchu and diving!
- Husband Lawrence also CS Prof – Grad School, A&M and now Illinois

Lori Pollock, University of Delaware

PhD & MS: U of Pittsburgh; 1986 BS CS & Economics: Allegheny College

Rice U: Asst Prof 1986-1989; U of Delaware: 1990-2024; Asst, Assoc, Full,

Emeritus (Jan 2024); Currently Senior Researcher and Prof Emeritus

Sabbaticals: ABB Inc and Army Research Lab

Research

- Software Engineering, CS Education

Research Group

- 3 current PhDs close to graduation; 1 undergrad
- Graduated 21 PhDs (9 profs)

Service and Outreach

- CRA-E, CRA-WP, CIC, Delaware K-12 Teachers

For Fun

- Outdoor activities, handcrafts, traveling, grandparenting

NUTS AND BOLTS

THE BASICS OF BUILDING AND MANAGING A RESEARCH GROUP

RECRUITING & SELECTING STUDENTS

MYTH: Rely on department admissions and look for good candidates.

REALITY: Actively work to recruit good students.
- Reach out to students before application deadline: own university, neighboring institutions, collaborators' institutions
- Call prospective students, get your students to meet them
- Participate fully in recruiting events
- Look for passion & work ethic – creativity is hard to judge
- Work with students as ugrad or MS students & recruit them

MANAGING NEW STUDENTS

MYTH: Give new students Ph.D.-sized challenges (throw them in the water and they will figure out how to swim model)

REALITY: Your job is to mentor and help students **grow** into independent researchers

- Assign problem/tasks: smaller vs. too big
- You set initial & next directions working with students
- Have them write, rewrite, & repeat (you nudge)
- Gradually hand over responsibilities, timing varies by student
- Creative work requires breaks: daily, weekly, each term

MANAGING A RESEARCH GROUP

MYTH: All successful research groups look the same… and yours will look like your advisor's (ok… maybe it will…)

REALITY: Your research group is like a startup & will have your style
- Different types of research have different needs, sizes, etc.
- Build mentoring hierarchies, esp. in larger groups
- Promote your students - you will be judged by their success
- Respect, listen to & make time for your students
- Don't clone yourself or be a helicopter or **snowplow** advisor!

SOME TIPS LEARNED FROM (LONG) EXPERIENCE

UNDERGRADUATE AND MASTERS STUDENTS

MYTH: Research is only possible with PhD students.

REALITY: Variety contributes to research portfolio.
- Masters students: Technical but short term.
- Undergraduates: Small well-defined projects, results quickly.
- How to manage: have senior grads do daily mentoring
  - Consider CRA UR2PhD participation for Grad Research Mentor training/undergrad Research Methods course
  - Mentoring critical to student success, particularly from underrepresented groups.

TEACHING STUDENTS TO WRITE RESEARCH PAPERS

MYTH: A student's writing skills are set when they start with you.

REALITY: Writing skills can be learned just like technical skills.

- Analyze structure of papers in your research area. Create a template.
- One thing at a time: Story ➡ organizational structure ➡ paragraphs and sentences in right order with right content ➡ sentences and words.
- Figures can drive the rest of content.
- Point out recurring problems.
- Poor writers improve with practice.

PERSONAL SIDE

MYTH: You can apply a formula to working with a student and turn the crank.

REALITY: Each student is unique, and research is a creative process.
- Ultimately, the work must be a good fit for their interests and skills, and inspire their passion.
- Determine their strengths and weaknesses and work from there
- Personal/medical/life issues will arise. Support inspires loyalty, but maintain boundaries.
- Serious issues, get help (e.g., counseling center).

WHEN IT'S NOT WORKING OUT…

MYTH: A bad student is better than no student.
MYTH: After you have invested [X TIME] you need to see it through.

REALITY: Sometimes it's better for all to make a change
- If it's not good for you, it's likely not good for them either
- In most cases, you can tell after working with a student for a semester & once you know, don't delay acting on it
- If a student needs to move on – to another advisor or leave with a masters, help them – they likely didn't want this to end this way
- Seek advice from your mentors – this is hard to do

A RESEARCH Lab is a COMMUNITY

MYTH: Students will find their own support community.

REALITY: Grad students need a support community.
- The research group can provide some of that support.
- Celebrate milestones and successes together
- Provide opportunities for informal social events to build sense of community (lunches, outings, …)
- Create a support structure for students (mentors, collaborators)

Now, it's time for your questions!