Successfully Mentoring Summer Undergraduate Researchers

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Mentoring Roles

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- The purpose of this talk is to teach key actions of effective mentors
Why Mentor?

• **Selfish Reasons:**
  • Mentoring is a crucial skill for graduate students and post-docs
    • You will be mentoring in your next role as faculty members or industrial scientists and engineers
  • Thus…
    • **Having strong mentoring skills is transferable to industry or academia**
    • **And your mentoring experience strengthens your resume**
Why Mentor?

• Idealistic Reasons:
  
  • *Pay it forward*
  
  • Universities exist for two reasons: to **create new knowledge**, and to **build human capital**
    
    • Research internship programs address both of these core missions
      
      • Provide undergraduates the opportunity to participate in research
      • And in so doing to broaden their scientific and professional horizons
  
  • **Successful research internships hinge on having great mentors in the labs!**
Mentor Expectations – Broad

• Enjoy this opportunity to inspire a junior scientist/engineer
• Keep the safety of your mentee paramount
• Provide the environment needed for your mentee to thrive intellectually
Mentor Expectations – Key Actions...
Key Action #1: Be Safe

- Safety is paramount
- Ensure that you emphasize this to your mentee
- Never place your mentee in a position where they are doing something that is both outside their comfort zone and potentially hazardous
- Be safe yourself (set the tone for your mentee)
Key Action #2: Be Prepared

• Assess your mentee’s abilities based on their academic background

• Based on this, develop a well-defined project with a realistic scope
  • Provide some opportunities for student to contribute intellectually

• Have the project defined several weeks before the start of the program
  • Make sure the lab PI and other lab members are aware of the project
Realistic Scope…

• This cannot be an MS or PhD project!
• Interns need clearly defined goals
  • Not trivial ones, just clearly defined – e.g. “Determine the influence of broth magnesium concentration on growth rate of C8-producing strain of *E. coli*.”
• Experiments where methods are well known
• Experiments where equipment is well characterized and materials are on-hand
Key Action #2: Be Prepared

• Ensure all equipment and supplies are on site the day the mentee arrives
  • A 3-week wait for reagent might be OK in an MS or PhD, it can derail a summer internship

• Have key documentation ready
  • Lab techniques/protocols
  • Background reading
Key Action #3: Be There

• Upon arrival
  • Provide project details
    • Provide context
    • Provide a vision for how their work could contribute to the lab (i.e., inspire them)
  • Provide PPE and safety training if needed
  • Introduce them to the lab
  • Set expectations (best practices; responsible conduct of research)
  • Encourage questions
**Key Action #3: Be There**

- **During the program**
  - There is no hard and fast rule on mentee-mentor contact time, but these are not advanced graduate students – they can’t be expected to go through orientation then work alone
  - Use review of weekly report as catalyst for discussions
Key Action #4: Be Positive

- People respond to positive leadership
- On at least a weekly basis, provide positive feedback to your mentee on some aspect of their efforts
Key Action #5: Be Proactive

• Stay engaged in their project
  • One approach is to develop the poster from early on
  • Weekly written reports or literature discussion sessions also possible

• If things aren’t going well, try to understand why?
  • Is the scope of the project too large given the student’s capabilities?
    • Don’t be afraid to shift
  • Is the student not adhering to a regular work schedule and communicating with others in the lab?
    • Don’t be afraid to reiterate the expectations
Key Action #6: Keep A Beginners Mind

• Think about yourself at an earlier stage of your education

• Be **patient** with the questions you are asked

  • Some of our deepest learning comes when we are challenged to explain concepts to a newcomer
What Might You Expect In Return?

• Some useful assistance in the lab
• Perhaps a new insight
• A protégé who embraces research because of you!

“This REU has been one of the best times of my life. I am not the same person today I was in May… I became a researcher … on your watch…”
Evidence?

- First edition of podcast made April 2012
  - The recommended *Key Actions* were based on my 18 years of faculty experience
    - Hosting over a dozen undergrad or pre-college mentees in my lab
    - Directing programs that have served more than 50 summer intern participants
Better Evidence?

- In early 2013, we surveyed 116 students to test two hypotheses that underlay the 2012 presentation, namely:
  1. Mentoring is the single most important predictor of internship success
  2. The six aspects of mentoring identified are all highly relevant to overall mentoring success
Methods

• Participants received survey including questions related to the quality of experience and the behaviors of their mentors

• Linear regressions examined the correlation between overall quality of summer research internship experience and mentor behaviors
Results of Our Study...

• A total of 76 responses were received
  • 65.5% response rate
Mentoring is Critical!

- Of all five primary aspects of program, mentoring correlated most strongly with student ratings of overall program experience

Figure 1
Correlation Coefficients ($r^2$) of Overall Program Experience with Primary Aspects of Program
These Six Actions are Key!

- Each were correlated with the mentoring experience score at $r > 0.64$
Summary

• Be Safe
• Be Prepared
• Be There
• Be Positive
• Be Proactive
• Keep A Beginners Mind
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Thank You!