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Postdocs as Mentors

Study says that when it comes to everyday mentoring and training in the sciences, postdocs are the new PIs.

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Finding a doctoral adviser who isn't just a great scientist but also a skilled mentor is kind of a crapshoot. Yet while having a trainee-focused principal investigator, or PI, in the natural sciences is certainly beneficial, a new study says it's not essential to the development of scientific skills.

Instead, the paper says, peer mentors within one's lab play a much more important role.

The study, published in *Proceedings of the National Academy of Sciences*, effectively compares the primary mentor-mentee model of scientific training, or the "cognitive apprenticeship," with what's referred to as a "cascading mentorship" model. And the authors -- including lead author David F. Feldon, professor of instructional technology and learning sciences at Utah State University, and Josipa Roksa, professor of sociology and education at the University of Virginia and co-writer of the [book](#) *Academically Adrift: Limited Learning on College Campuses* and more -- found that PIs' lab and mentoring activities don't significantly predict students' skill development. Peers' involvement really does.

In their long-term study of 336 Ph.D. students in the biological sciences from 53 U.S. institutions, Feldon, Roksa and their colleagues found a positive link between students' skill development trajectories and the active engagement of postdoctoral fellows and more senior students in lab discussions. More precisely, students were 4.5 times as likely to have yearly skill development growth when advanced graduate students joined in lab discussions. They were five times more likely to have that kind of positive development when postdocs were involved in lab discussions. And they were 4.2 times more likely to have positive skill development trajectories for the study duration over all when postdocs were active participants in lab discussions.

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What are the implications for graduate education in the natural sciences? The study says that postdocs, for one, “disproportionately enhance the doctoral training enterprise.” That’s despite the fact that they typically have no formal mentorship role.

Beyond the quantitative data, other qualitative data from student interviews indicate that postdocs mentor doctoral students “in myriad ways, most commonly by being present in the laboratory to provide ongoing and hands-on instruction and professional guidance,” the study says. “As the practice of science has shifted toward larger team enterprises and an increasing pace and volume of workload, the nature of the PI’s role has shifted to one that often entails less direct contact with students.” Postdocs, then, and others within the lab, may “step into the gap that is created, with unexpected dividends.”

Going forward, the study suggests that labs intentionally adopt cascading mentorship models and train postdocs to be even better mentors than they already apparently are.

Other studies have found that institutional policies surrounding postdoc working conditions are underdeveloped and that they’re not fairly compensated.

Roksa said Thursday that the contributions of postdocs “go much beyond what is generally considered their role” and that “selection, training and reward structures for postdocs should reflect the full breadth” of that work. She stressed that the study is not about individuals or pitting PIs against postdocs, saying there are “great postdocs and PIs and not-so-great ones.” The issues are structural, including “how do we select, train and reward postdocs. These issues need collective attention at both institutional and national levels.”

Feldon, too, said PIs who are good mentors probably “help students develop broader strategic thinking about their science and their careers, guiding students along paths for which research skills are necessary but not sufficient.” And even if postdocs are the ones working “elbow to elbow” with students nowadays instead of PIs, given major shifts in academic science, that doesn’t mean postdocs have acquired “the full wisdom of PIs, with a decade or more of additional professional experience.”

To measure students’ development, the researchers identified a dozen different scientific skills and assessed students on them each year for four years, to see if they’d moved between low-, medium- and high-skill subgroups over time, in a “latent profile transition analysis.”

Research skills were based on students’ sole-authored writing samples, such as draft manuscripts or comprehensive examinations. The 12 skills gleaned from those samples included introducing and putting a study in context, establishing testable hypotheses, using appropriate controls and replication, experimental design, and selecting data for analysis.

From year 1 to 2, year 2 to 3 and year 3 to 4, 37, 24 and 7 percent of students had positive transitions, respectively. In an advanced analysis, those data were paired with detailed student survey data on their interactions with faculty mentors and the roles of various peers in their labs.

Roksa wasn’t necessarily surprised by the general findings in support of cascading mentorship, as close observers of academic environments know that “a lot of mentoring happens among different members of the lab.” Yet it did surprise her that postdocs and senior graduate students have such an important role in skill development.

“We often think about postdocs and senior graduate students helping younger students acclimate, manage time, navigate the unspoken rules of academia” and more, Roksa added. “Finding that postdocs have such an impact on skill development is notable.”

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Feldon, who directs graduate program assessment and development at Utah State, said he was also surprised by the quality of faculty mentoring having no measurable impact.

Still, he said, “in modern laboratory science, the PI is often out of the lab, working to ensure the continuation of funding or attending to other faculty responsibilities.” So postdocs are often the “more knowledgeable others” who are “at the bench working with students in the lab day in and day out.”

PIs, therefore, might want to select their lab “teams” based on more than individual scholarly productivity, such as “willingness to engage in broader conversations and interactions within the lab” and maybe even kindness and patience, Feldon said. The lab benefits in the end, too, since better-mentored students will be able to contribute more.

A anonymous Ph.D. student in Toronto who runs several social media accounts under the name [Ph.D. Diaries](#), in part to critique the culture of graduate school, told *Inside Higher Ed* that the findings “absolutely” rang true with her own experience.

“My peers were my absolute saviors when I was getting poor mentorship,” she said, adding that she leaned heavily on a senior Ph.D. student in the lab where she studied for master’s degree. “I owe him everything.”

Yet even in a lab with a great supervisor, like her current one, “complementary” peer mentorship is crucial, she said.

“I am deeply indebted to the incredibly intelligent people around me. Real scientific learning and progress does not happen when you’re by yourself reading papers until 2 a.m. It happens in small, serendipitous conversations benchside at 2:45 p.m., 15 minutes before your weekly meeting with your boss, at coffee hour, etc.”

The new study’s other major pitch is that graduate education should, and can, be based on evidence-based teaching practices -- not just the apprenticeship tradition rooted in a vanishing reality.

Echoing the paper’s review of existing literature, Feldon said that various studies demonstrate that faculty members make decisions regarding the training for their graduate students “based almost exclusively on their own personal experiences.” Empirical evidence of effective practices, meanwhile, “never comes up.”

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