How to create a fertile environment for undergraduates in your lab

The success of an undergraduate in a lab depends as much on sociology as on science. While some types of students are better suited for some labs than others, there are characteristics and behaviors that are correlated with laboratories successful in retaining and publishing with many types of undergraduates. Not all indicators are present in every successful undergraduate lab relationship, but we encourage host labs to use this list reflect on how to maximize undergraduate student retention and success.

In labs fostering student success, undergraduates …

- receive very clear expectations (of them and the lab).
- communicate regularly with PI so that the PI knows their work ethic/questions/concerns outside of what is filtered through the bench mentor.
- are given intellectual access and responsibility. They are not just told what to do, but are given the reasons for particular procedures/experiments and encouraged to understand the reasons for each step/reagent in a protocol. They are asked what they think the next experiments should be. They are encouraged to read the literature and discuss their findings or questions with their lab mates.
- are treated as junior colleagues and are kept abreast of the progress of research in the lab and made to feel as if their participation is important and that their voice is heard.
- are introduced to the entire lab (scientists and research projects).
- attend and participate in lab meetings.
- see questions being welcomed and encouraged. They see the members of the lab asking questions of each other and more senior members encouraging questions of more junior members.
- see the members of the lab resolving problems or conflicts with respect—criticism is constructive and person to person (not behind backs).
- see collegiality and support among the members. They see members helping each other with manuscript edits and scientific ideas. They see reagents and information being shared.
- see a respect for diversity (background, gender, race, nationality, leadership/learning/working style, scientific experience, and academic interests). In addition, students who have occasional opportunities to attend multi-group meetings appreciate seeing other labs with different styles and approaches to a related subject.

We want to help undergraduates to understand the goals and motivations (scientific and sociological) of lab members so that they can better understand how to contribute to and learn from the larger group. For example:

- If they don’t understand the larger context of their research, they may not understand which procedures are for protocol troubleshooting/testing and which are aimed toward novel findings. These students have trouble explaining what they are doing to others, have trouble prioritizing experiments, and are less intellectually engaged.
- If the purpose of each of the step/reagents in a protocol (and typical pitfalls) aren’t explained in detail it will take them longer to troubleshoot when things don’t work.

Students can be indirectly impacted by negative lab dynamics. For example:

- If they hear a question being dismissed or ridiculed, they will be afraid to ask questions. Because questions are a requisite part of the scientific process, these students are delayed in their scientific/intellectual development and flounder because they are afraid to ask for assistance in troubleshooting protocols.
- If students hear a senior member roughly dressing-down a junior member or criticizing that member behind their back, the environment will be stressful for them. Students internalize the criticism of others (even if it doesn’t apply to them) and fear they will be next. Labs with this dynamic often have a poor reputation for undergraduate retention.