

SMALL GROUP MENTORING OF PHYSICS MAJORS: THE DALHOUSIE EXPERIENCE

Every year brings the inevitable students who haven't considered post-graduation plans before graduating, or never speak to profs outside of office hours, or have only a fuzzy view of research. How can we better address that? My memories of my own undergrad days are slowly fading --- and weren't typical in the first place. A steady-state approximation of departmental size implies that I will teach only one undergraduate physics major every couple of years who will have comparable skills and goals to my undergrad-self. How can I better get into the heads of the other students I teach? The flavour of professional "cutting-edge" research, behind-the-scenes teaching, and professional service could be an interesting and motivating part of the general undergraduate experience. However, NSERC USRAs are only available to a small fraction of physics majors, independent project courses are typically only in senior year, and there is typically little capacity to offer a professional-skills course. Mentoring provides a mechanism to address these issues.

In the business world, mentoring relationships are typically one-on-one. This is also essentially the grad-student/supervisor model. Conversely, most mentoring programmes for undergraduates are aimed at first year students, and pair a senior undergrad or faculty mentor to many (say 20) "mentees". Mentors meet each mentee individually at the start of the year, but not regularly after that. Reflecting on faculty time-demands tells us why: a course involves approximately 50 contact hours, and if 10% of that can be added to someone's workload "in the noise" then mentoring shouldn't require the mentor to devote more than 5-10 hours a year. Meeting 20 mentees individually more than once a year would simply take too much time. Individual one-shot mentoring appears best suited for large programmes (such as pre-med) or years (such as first year), where it can at least provide a friendly face. But one hour a year is not enough to explore the professional life of a physicist, or of a student. In physics, relatively small class sizes after first year provides an opportunity for an ongoing small-group mentoring model.

In the Department of Physics and Atmospheric Science at Dalhousie University, we are currently in our third year of small-group mentoring. It appears to be sustainable, with approximately 50% of our faculty volunteering and 50% of our 2nd-4th year physics undergraduates participating every year. Many of both the students and faculty return to mentoring after their first time, despite receiving neither teaching credit, nor course credit, nor financial support. We believe that speaks to the perceived value of our men-

toring programme, though we have not attempted to measure any value added. Our approach is deliberately simple and should be easy to replicate at other institutions.

Faculty mentors meet with their groups of 4-6 student mentees for one hour meetings approximately once per month during the academic year. This intensity only requires 5-10 hours per year from each mentor, which does not seem to be onerous. However it is frequent enough for mentees and mentors to get to know each other over the year. What determines the group size? More than 5-6 mentees in a group can lead to large unwieldy meetings. Fewer than four mentees in a group occasionally leads to small meetings, with one or two mentees and an unfamiliar dynamic. Smaller groups also require more mentors. Why not use graduate students or postdocs as mentors? There are a number of reasons for this. First, we don't need to. Second, faculty can provide a more complete picture of the professional life of a physicist and conversely can benefit most from the students' perspective. Third, one intangible benefit of mentoring is validating students in their professional training by simply "being there". Using faculty helps to effectively convey the importance of students within a department. Lastly, faculty are around for decades --- and so hopefully can create a long-lasting and excellent mentoring culture within a department.

Mentors often meet their groups at a local coffee shop, and treat their mentees out-of-pocket. Some mentors meet in their office, without the benefits or costs of caffeine. We encourage all faculty to volunteer, though in practice we have not used emeritus or sessional faculty and all faculty mentors have been "research active". This is probably important, since much of the discussion ends up being around research. We encourage all students in 2nd-4th year physics classes to participate. At first, we had an opt-out approach and automatically signed up all declared majors. However, this led to a lot of no-shows. Now we have an opt-in approach, and most mentees show up to mentoring meetings if they don't have a conflict. With opt-in, it is important to have all faculty pitch mentoring to their undergraduate classes --- especially 2nd year physics classes.

Mentoring advertising is done in September, and a scheduling sheet is distributed widely by hard-copy and email. The scheduling sheet blocks the week off into one-hour blocks, and both mentors and mentees are asked to cross-out hours for which they are not available. [Asking for available slots yields preferred rather than possible slots.] Mentees are also given the opportunity to request specific

faculty to mentor them, though we substitute participating mentors with similar research interests for non-participating faculty.

Towards the end of September, when new scheduling sheets stop showing up, two mentoring “coordinators” take an hour or two to distribute mentees among the mentoring groups and to pick a suggested day and time in the week for each group. Two coordinators are needed to maintain the appearance and good form of the process. In practice we’ve always had more mentors than needed for optimal group size, so some discussion is needed to choose the mentors who will participate. Scheduling and student requests play roles in that decision. We try to respect any requests for specific mentors, then we give each mentor a broad range of years (as a start: two 2nd, one 3rd, and one 4th year mentee), then we fill in and reallocate as needed to accommodate all mentees and to fill all groups. The broad range of years in each group serves to make connections between different cohorts of students, reduces “group- think”, and keeps things from getting dull. We considered various schemes for gender balance, either spreading genders uniformly or clustering them, but eventually gave up worrying about it. We have not attempted to use web scheduling schemes.

The biggest ongoing problem we have is in transitioning the groups from the Fall to the Winter term, when the schedules of both students and faculty change. Almost any barrier inhibits regular meetings, including the barrier of updating schedules. Our first try was to completely reform groups at the end of the first term, but many students didn’t update their schedules. Our next try delegated the job to the mentors, but some mentors didn’t follow through. This time we’ll try a hybrid approach, delegating to faculty the rescheduling for their own group in the second term but independently reminding their mentees to badger them until it happens.

Scheduling individual meetings with a mentoring group is not simple for the faculty mentor, even given the day-of-week and time of the meetings. The best practice is to offer a choice among three weeks for each meeting (to avoid midterms, travel, and such), then remind three times once the date is set: one week ahead, one day ahead, and on the day. This is less work than it sounds, and less frustrating than having a lot of no-shows.

What is discussed in the meetings? My advice to mentors is “ask about things you are interested in”, and email your group the occasional science-news article to provide raw material for discussion. Originally there were some fears that mentoring sessions would be like group therapy, but that doesn’t seem to happen (and isn’t encouraged). Instead, students often ask about careers and faculty research. Faculty often ask about course and programme choice, past and future career decisions, and summer plans. This varies from group to group, and from month to month. Initial questions often lead to broader discussions. There doesn’t appear to be a shortage of topics after the first meeting. We do have occasional “mentors-only” meetings (during exam periods), to discuss our various approaches and to identify any hiccups.

Is all the effort worthwhile? First, it really doesn’t feel like a lot of work. Second, it strengthens links between faculty and students in an inclusive and professional way. As a professor, it gives me more insight into my students and so improves my teaching. For students, we hope that it increases the number who “catch fire”. I think that it helps some students to be more thoughtful and proactive about their professional choices: from course selection, to summer jobs, to post-graduation plans. We keep tinkering with mentoring, but we think that it is already a model that could and should be more widespread. Anyone wanting to go ahead with small-group mentoring is welcome to get in touch!



Prof. Andrew D. Rutenberg,
Department of Physics and
Atmospheric Science
Dalhousie University
<http://www.physics.dal.ca/~adr>