USE OF A GRANT WRITING CLASS IN TRAINING PHD STUDENTS

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As an approach to train graduate students in key aspects of scientific communication and writing that would prepare them for broad career opportunities, faculty at Emory University School of Medicine designed and implemented a formal course termed “Hypothesis Design and Scientific Writing”. This course, which began in 1998, is taught as a full semester course that meets weekly for one 2-hour session. Enrolled students work closely with a collaborative team consisting of their research mentor and course directors to conceive and craft a research proposal. In course meetings, each section of the research proposal is introduced and strategies for structuring these sections are presented. Didactic lectures are supplemented by active discussion, writing exercises, and presentations during class meetings. Each week, a draft or revision of a different grant section is due. Students receive extensive written feedback on each assignment. Assignments are due at the class meeting, typically Friday, and returned with comments the following Monday. With this timeline, students have ample time to make multiple revisions and obtain feedback from their research mentor prior to the next due date. An advantage of the course structure is that students delve deeply into their proposed project and benefit from early experience in writing collaboratively with their research mentor. As a measure of outcomes, many of the students who use the grant proposal from the course as the basis for an extramural grant submission are successful and Emory is currently among the leaders in the number of extramural grants held by our trainees.

Our grant writing class in the Biochemistry, Cell & Developmental Biology (BCDB) program is required for every student in the first (fall) semester of their second year. However, the value of this course has led to its adoption by other graduate programs who may offer the course in the spring of the second year. Our students are expected to choose a research advisor/mentor at the end of their first year in the program, spend the summer in that laboratory devising a research project and gaining some initial experience with the central methods employed in that laboratory. They must then begin developing a defensible thesis proposal at the start of their second year. We are fortunate at Emory in the biological sciences that the Laney Graduate School provides support for all of our students for the first 18 months in residence. This support allows us to fashion a rigorous curriculum and time intensive course like this, without incurring the wrath of mentors who would otherwise be supporting the students, typically through their own research grants. The vast majority of research proposals are written on the topic of the student’s thesis research, forcing them to delve deeply into the literature and thinking about their project at an early point in their training.

Each class period consists of a didactic lecture on a particular grant section, including strategies to communicate the information of that section in a precise and concise manner. Examples are employed to illustrate these strategies, drawing on grants from previous students in the course (with their prior approval) and information available

through the NIH Reporter website (https://projectreporter.nih.gov/reporter.cfm/). In addition to the lecture portion, most class sessions incorporate a discussion-based or active learning component. For example, early in the course, students present their proposal to the rest of the class in a required five-slide format that consists of: (i) title of proposal; (ii) introduction: what the problem is and why one should study this problem; (iii) model slide; (iv) specific aim 1 with experimental design and (v) specific aim 2 with experimental design. These presentations and the in-class writing activities trigger extensive conversation and allow students to adjust their thinking and writing to convince the reader of the importance of the proposed study and convey to the student the importance of reaching a broad audience. Through this combined didactic and active, peer learning the single class period serves as an important complement to the weekly writing assignments.

During the course of the semester, each student writes a research proposal in the format of an NIH F31 pre-doctoral fellowship; specifically, the Specific Aims (one-page limit), Research Training Plan (6-page limit) and scientific and lay summaries. The student also prepares an NIH-style biosketch. One of the most valuable aspects of the course is the enforced timeline to draft each section of the proposal with time allotted for significant feedback. At the end of the course, research proposals are 'reviewed' in two phases. Three weeks before the final deadline, penultimate drafts of each proposal are submitted. These draft proposals are sent for review by a senior (typically fourth year) student in the BCDB program who has previously taken the class. Within one week, the senior student submits written critiques and comments and meets with the proposal's author to discuss. This deadline allows two weeks for the inclusion of that input prior to submission of the final proposal. We have found that this peer instruction is as, and often more, valuable than the final critiques from two faculty members. This approach also provides senior students in the program with the opportunity to acquire or hone their skills in providing constructive criticism from the act of grant reviewing. This too is invaluable training, as anyone who has served on a study section can attest. The final grant is then turned in and sent to two faculty members, not the mentor, selected from those with students in the current class or volunteers. Faculty scoring follows the NIH scale (1–9, with 1 best and 9 worst) using a guide that addresses each section of the grant covered in the course. These scores figure prominently, although are not sole determinants, of final grades for the course.

We believe that training students to invest substantial amounts of time in the planning of optimal research strategies with input from a range of colleagues is a significant benefit of this course. When this training is coupled with specific strategies to communicate clearly and convincingly in their writing, students are likely to emerge from graduate school with these very marketable skills making them valuable hires to a wide range of employers. We suggest that these skill sets embody the very essence of graduate training. Although our comments and course focus on experience in the training of students in the biomedical sciences, comparable approaches could be applied across disciplines as valuable and practical training tools.

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