Mentoring

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Summary

Effective mentoring is essential.
Although mentoring alone may be insufficient, mentoring is essential to promote a positive attitude and understanding of the responsible conduct of research.

Mentoring is a shared professional responsibility of all scientists.
The enterprise of science depends on effective communication not just about the science, but about the practice of science, standards of conduct, and ethical and social responsibility. Taking an active role in helping to train the next generation of scientists should not be optional. And scientific trainees have a complementary responsibility to take an active role in their own development and seek mentors.

Background

Mentoring the next generation of scientists is a responsibility for current scientists. A mentor has experience with the challenges that will be faced by a trainee, the ability to communicate that experience, and a willingness to do so. A mentor assists the trainee in understanding and adhering to the standards of conduct within their profession. In this way, mentoring of new researchers by senior investigators passes on the informal and possibly unwritten standards from one generation of scientists to the next. Within a small research group, this mentoring may readily occur, but many current research groups are too large or competitive. Whether or not this has changed the extent to which new scientists become aware of prevailing standards of conduct, it appears that issues of responsible conduct are discussed infrequently.

Eastwood et al. (1996) found that nearly 40% of postdoctoral research fellows responding to a survey at the University of California, San Francisco reported having had no guidance in ethical research from a scientific mentor. Brown and Kalichman (1998) found that half of graduate students responding to a survey at the University of California, San Diego reported that the total time spent discussing responsible conduct of research with a major professor or advisor had been one hour or less. In a nationwide survey of doctoral students, Swazey and Anderson (1998) found that for nearly every

defined dimension of training in ethics, over half of the respondents reported that faculty members provided little or no help.

A mentor teaches responsible conduct explicitly and by example; mentoring involves both what is verbalized and what is demonstrated in practice. For better or worse, the default method of teaching the traditions and standards of science is often by unwitting and serendipitous example. Unfortunately, without discussion of ethical principles and the purposeful assurance that everyone is included, this approach to training is seriously flawed. Principles of decision-making are not explicit and are therefore open to interpretation and misinterpretation; moreover, many important roles of scientists, such as peer review and negotiating collaborations, are not observed by the trainee. An absence of adequate mentoring can have significant consequences for the integrity of research. In their survey of 2000 doctoral students, Anderson et al. found that departmental climate was the strongest predictor for misconduct (Anderson et al., 1994). Overall, misconduct was found to occur more often in those departments in which the climate favors competition and discourages collaboration. However, research misconduct occurred least often in those cases in which students felt that their advisors, or others, provided useful feedback and evaluation. These findings are consistent with the view that explicit mentoring serves to promote the responsible conduct of research and to reduce the risk of research misconduct.

Regulations and Guidelines

Despite its presumed importance, no regulations explicitly require or prescribe standards for mentoring. The lack of absolute rules is appropriate, since the success of mentoring depends on the widely varying skills, needs, and attitudes of different individuals. Nevertheless, federal requirements encourage and sometimes require 'instruction in the responsible conduct of research' (NIH, 1989, 1992), and mentors ideally have an important role in delivering that instruction.

Mentors should:

- help trainees in their technical development as capable researchers
- assist trainees with the job market
- socialize trainees in the political, ethical, economic, and social dynamics of academia
- teach about teaching, working in teams, leadership, administration and planning, and budget management
- help address special circumstances (e.g., issues related to gender, race, national origin, language, or disability)

Many resources (e.g., several are listed under the *Resources* tab) are now available to guide both mentors and trainees in optimizing mentoring. The importance of mentoring for training in the responsible conduct of research has been recognized in both research studies (e.g., Douglas-Vidas et al., 2001) and national reports on the integrity of research. For example, a report from the Institute of Medicine (1989) noted the

importance of mentors and specifically recommended that departments and research units should monitor the supervision and training of young scientists to ensure that it is adequate (Committee on Science, Engineering, and Public Policy, 2000).

Discussion

Case Study 1[i]

Bill and Sara meet in an introductory graduate course and over the span of the upcoming academic year, fall in love and get married. At the beginning of the second year they select different mentors in the same department and begin their dissertation research. The mentors and their groups frequently collaborate and co-author publications. They both work extremely hard, but frequently Bill helps her in the lab. On weekends they are commonly seen working together doing experiments which are exclusively part of Sara's research project. Over the course of the next three years Sara prepares 6 senior authored manuscripts and all are published in peer-reviewed journals. Bill is not included as an author on any of the papers, but he is acknowledged in 5 of them. In her last year in the program, Sara wins the prestigious graduate student honors day award and is also selected by the departmental faculty to receive the outstanding graduate student annual award. Recently, Sara has been offered a permanent position in a biotechnology company. Bill is not likely to be finished with his dissertation research anytime soon, and has no publications or even abstracts to his name. A small group of graduate students meet with you, the departmental chair, and bitterly complain that Sara has had an unfair advantage during her graduate research career. They claim her publication record is deceptive as it fails to account for all the "extra collaborative help" she received from her spouse. They claim both she and her mentor are party to inappropriate practices. They want you to intervene in some way.

Case Study 2[ii]

Dr. Mentor has had an active research program for 20 years and is well respected by his peers and his trainees. Because of his reputation and the caliber of his work, he has always attracted extremely talented graduate students to his laboratory. For a variety of reasons, Dr. Mentor's department has recently been accepting more students into the program, resulting in a greater range of ability. One of these new students, Ricky Trainee, showed some promise, but after 5 years in Dr. Mentor's laboratory, it is clear that Ricky is probably one of the worst students Dr. Mentor has ever trained. Ricky is certainly competent, but he does not stand out for his creativity, his ability to grasp new concepts easily, his willingness to work hard, or his ability to write. Nonetheless, Ricky's work will be sufficient to complete the program. Ricky has asked Dr. Mentor for a letter of support for his applications for postdoctoral positions in one of the two leading groups in his field of research.

Case Study 3[iii]

Amos Jones was accepted to an excellent graduate program in molecular biology. The faculty was relatively small but there were two outstanding professors, Claire Cheng and Patricia Slocum, who really determined the quality of the graduate program. Amos had been encouraged to train under Dr. Slocum by his undergraduate advisor.

Amos planned to do rotations in both the Cheng and Slocum laboratories. When inquiring about the research activities in the labs, Amos was told by Dr. Slocum's trainees that whether for a rotation or a thesis, Amos would be given a specific project, he would be expected to communicate results only to his direct supervisor, and he would have to give a formal presentation on the progress of his research once every two months. They noted that daily handwritten and dated entries were required for their laboratory notebooks. Much of the work had potential for commercial applications, so the laboratory was locked even during the day, with entry limited to the staff. The graduate students were reluctant to describe their experiments. The pace was very intense and trainees were required to prepare abstracts for the two important national meetings every year. The trainees also noted that many famous investigators visited the lab, spending time in formal and informal scientific discussion. Trainees were allowed to examine copies of papers that Dr. Slocum had received for review and to discuss them at lab meetings. They also saw an occasional grant application that she was asked to review. The trainees expected to be in great demand for postgraduate fellowships.

Professor Cheng's students reflected on the openness of the laboratory and her constant and immediate availability. They thoroughly enjoyed broad scientific interplay within the lab and with investigators on campus and elsewhere. They indicated that they were encouraged to explore their own ideas and expected to select their own thesis project. The students gave no formal presentations except when rehearsing for meetings. Progress in the laboratory was episodic rather than steady as various concepts were explored. Although their notebooks were not specifically examined, Dr. Cheng knew about every experiment and provided constructive criticisms and suggestions. Dr. Cheng did not go to many meetings and refused to show papers she received for review to her trainees. The students admitted that they felt a little out of touch with the newest developments in the field. Although Dr. Cheng did not enjoy the same prestige and reputation as that of Dr. Slocum, the trainees said Dr. Cheng's lab was a much more pleasant and collegial environment in which to work.

Discussion Questions

1. Discuss the role of mentoring in promoting the responsible conduct of research.
2. What are the roles and responsibilities of trainees in promoting effective mentoring relationships?
3. About which aspects of your career path do you feel least prepared? Who, or what kinds of people would be best positioned to help fill your needs? How might you initiate or promote a role for one of these people as your mentor?
4. What are the characteristics of an effective mentor? What similarities and differences characterize mentors and supervisors?

5. What guidelines or programs are in place to promote mentoring in your institution?

Additional Considerations

Advice

A mentor's role is to provide advice, help, and encouragement, to guide rather than decide for the trainee. The trainees' responsibility is to seek out mentors and to act based on their own values, goals, and experience.

By words and example

Modeling good skills and behavior is a necessary element of mentoring. A mentor who argues for rigorous authorship criteria must act on that advice, or trainees will see it as hypocritical posturing. Yet a good example is not always enough; it's important that mentors make explicit the often implicit rationale for their behavior, because trainees will not learn the policy and philosophy underlying exemplary behavior by observation alone.

Multiple mentors

Widely ranging needs at different stages of a career are not likely to be met by a single mentor, and few established scientists can offer the requisite time, knowledge, and interest to the full range of issues likely to confront a trainee. For these reasons, the term mentor is best used to mean any person who helps another with one or more aspects of the latter's personal or professional development. In this sense, trainees are encouraged to seek out multiple mentors, each of whom can provide the expertise and experience to help fulfill the trainee's needs.

Differences in personalities

Some mentors will be uncomfortable offering advice or initiating discussions unless first asked by a trainee, while other mentors will readily volunteer information and advice without any clear indication that help would be welcomed. Similarly, some trainees see frequent and probing discussion with a mentor as invasive micromanaging, while other trainees thrive on frequent feedback. Effective mentoring is more likely when personalities of the mentor and trainee are aligned.

Resources

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Endnotes

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[ii] This case was contributed by Dr. Michael Kalichman (kalichman@ucsd.edu) of the University of California, San Diego. ©1999
[iii] This case was contributed by Allan Shipp (acshipp@aamc.org) of the Association of American Medical Colleges. ©1994