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Note to Students and Instructors

Many of the topics covered in teaching scientific integrity lend themselves to the case study approach and we have found its use in our course to be instructive and enjoyable. Our suggestions for making the case study approach work well are presented here and are intended to aid both students and instructors. Additional examples of case studies in responsible scientific conduct may be found in the books by Komeman and Shipp (1994), Bailar *et al.* (1990), and Penslar (1994).

How To Use End-of-Chapter Case Studies

Short case studies are found at the conclusion of all but the introductory chapter and are designed for classroom discussion. Most of these depict a "real life" scenario and contain a narrative script with fictitious characters. Others cover issues for thought and discussion. The typical case study is 200 to 400 words in length and can be read aloud in a few minutes. Most have been tested in our course.

A few that are only modestly challenging have been placed at the beginning of each set of chapter cases. Using these cases to get started is recommended. These are designed to acquaint the student and instructor with the process of case discussion and resolution using examples which lack the complexity of later cases in the set.

On the first day of class, we distribute a printed copy of all the cases, and groups of cases are assigned to students for each of the subsequent class sessions. These students will be called on to discuss the case on an assigned date. The students select cases they are interested in from their assigned set of cases (relevant to each day's topic). Small groups of two to three seem to work best in implementing this strategy. Students can decide among themselves on a few cases and prepare for their presentation. By assigning a case set in advance of the class, students have a chance to think about their arguments, and also have time to do research or consultation on the topic if needed. They may, for example, want to consult relevant guidelines or policy documents. Although most cases don't require research, they may not work as well when students have not been exposed to a graduate research environment.

Sets of cases should be assigned to small student groups ahead of the class in which the corresponding chapter material will be covered. The students should select cases they wish to discuss and then individually lead the discussion in the class period. Guidelines for leading discussion are given below. Our class periods are either 1 or 1½ hours, and we allow for a minimum of 20 minutes to discuss two to four cases.

A student leading the discussion begins by reading the case aloud in class. He or she then acts as the moderator for the rest of the discussion of that particular case. Discussion is aided by a seating arrangement that allows everyone in the classroom to see one another (e.g., seating around a conference table, or arranging chairs into a circle or semicircle). Typical classroom seating arrangements with students facing the front *of* the room make it difficult for everyone to see who's talking during open discussions and this inconvenience can dampen group participation. Case discussions work well in small classrooms, optimally with fewer than 20 but not more than 25 students.

Effective student participation is central to the process. The instructor should only serve as a facilitator, contributing when clarification is needed, when discussion bogs down, or when closure on a case is appropriate. The student reads the case and presents his or her impressions, identifying the issues and suggesting a possible solution. The classroom is then open to discussion where students air their views on the topic (without having more than one person

talking at once). The instructor or student moderator may have to act as a peacekeeper. Sometimes disputes arise; discussions can become animated and even intense. *If* the dialogue becomes emotional, insulting or inappropriate comments should not be allowed. Ad hominem comments are totally unacceptable and discussants should be cautioned against their use.

Short cases are designed to encourage the discussants to think critically as they analyze and solve the problem at hand. For many cases, this will mean dissecting the facts of the case and separating the relevant issues from those that are irrelevant. Cases will evoke uncertainties and ambiguities, and the discussion can begin by having students ask questions about the case. If something needs clarification or explanation, it should be provided by the student leading the discussion where possible or by the instructor when help is needed.

The cases are specifically designed to allow discussants to apply their knowledge and personal standards to problems encountered in doing scientific research. Discussion should often lead to one or more acceptable solutions to the same problem. This is important to remember in bringing cases to closure. Much of the time a consensus answer will not emerge. There may be several "right answers," all of which are acceptable. In proposing solutions, discussants should always be able to arrive at a position that can be defended. Answers may be ranked by merit as part of the case discussion, but usually this is not necessary. A solution is valid as long as it is legal and doesn't violate what the discussants view as acceptable norms and standards, written or otherwise.

Acceptable solutions to the problem posed by the case always must be in compliance with standards related to global considerations (e.g., issues related to plagiarism or human rights). Solutions to cases always need to be examined to be sure they cannot be misinterpreted. In other words, they should not contain any "loopholes." Although there may be several acceptable solutions or answers to the problem, there always are clear "wrong answers." Such things as violations of specific standards, guidelines, or rules and regulations fall into this category as well as solutions that are inconsistent with the written or unwritten ethical standards for scientific conduct generally accepted by the profession.

The case reader should evaluate the quality and quantity of the class discussion and bring the case to closure at the appropriate time. Summarizing the discussion helps to do this. Any opposing points of view should be adequately represented in the summary. Occasionally, there may be students who are uncomfortable with the outcomes reached. If this happens, the instructor should urge continued discussion outside of the classroom with him or her or with the student's mentor.

In summary, case discussion should foster critical thinking as the discussants examine and apply their personal and professional values. The process is one of self discovery as students formulate answers based on their values and knowledge of professional standards. The application of relevant guidelines, codes, and policies should be brought into play whenever possible. One final note on case resolution. We have deliberately omitted discussing the possible "answers" to the cases. Cases often have multiple acceptable solutions. Hashing over multiple acceptable answers runs the risk of assigning specific values to the various possibilities, which we feel is not desirable. Further, conflict resolution has too many subtleties to presuppose that simplistic answers can be applied universally to behaviors that have elements in common with a case study. The process of solving the case studies is key to learning from them. Finally, each case will have readily apparent "wrong answers," and we anticipate that these will be obvious.

Extended Case Studies and Surveys

Appendix II contains a different style of case study. It is longer and usually describes a more complex scenario. The required response is usually guided by specific questions or by a request to complete a written exercise. We call this format the extended case. A number of these appear in Appendix 11 and explore in depth specific chapter topics. We have successfully used these extended cases to form the basis of a writing assignment for our course. Students have been

required to select four cases and write a response of one to two typewritten single-spaced pages per case. In effect this becomes a "term paper" upon which part of the course grade can be based.

Appendix I contains some surveys which we have found to be useful teaching toots, As with the short cases, we assign these surveys to small groups of students on the first day of class. They collect the completed response sheets from their classmates on an assigned date, collate the data, and present an analysis of the results. Printed response sheets corresponding to each survey are provided by the instructor. Anonymity is a requisite in these surveys and this is stressed in the instructions printed on the response sheet. The assignment includes the date by which the rest of the class must turn in their responses to the students conducting the survey. A date on which the results of the survey will be discussed in class is also set. Class time is reserved during a relevant session for discussion of the survey results. The student survey-takers then collate the data and prepare a handout or overhead transparency for class presentation of the results. Discussion is led by the student survey-takers and class participation is encouraged. For example, responses to questions that displayed considerable disparity can be explored. Invariably, there will be questions where a significant number of students strongly agree with a point of view, while a similar number strongly disagree with it. Discussion of such differing points of view can be valuable. In that sense, we have found that these exercises have provided some of the same benefits as the short case discussions. Class debate is lively and students come to recognize and appreciate differing points of view on issues related to scientific conduct and training.

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