A Step-by-Step Guide to Students Writing Case Studies (and Tools for Novice Case Authors)

By Annie Prud'homme-Généreux

Learning to research, evaluate, synthesize, select, and communicate scientific ideas from a variety of sources is at the heart of an undergraduate education. Five years ago, I proposed to my freshmen nonmajor biology students that they write a case study for their final project (i.e., use a story as a scaffold to structure a learning experience for their peers). Having recently created several cases myself, I observed that by doing so I practiced many of the skills that I hoped to foster in my undergraduates. This assignment was a success; narratives were creative, students did thorough research, and nearly a quarter of my students produced cases that were eventually peer reviewed and published in the case collection of the National Center for Case Study Teaching in Science (NCCSTS), accessible at http://sciencecases.lib.buffalo.edu/cs/. Eager to share my experience, I wrote an article describing the assignment and my experience (Prud'homme-Généreux, 2013). Since that time, I have assigned this project in nearly all my courses, be they for freshmen nonmajor or graduating honor students. In experimenting with ways of structuring the assignment and providing guidance to students, I developed a series of tools that may be of interest to instructors wishing to implement a case-writing assignment in their course. This assignment is more suited for instructors experienced in case writing, as their knowledge of how to design a case will help them advise their students. However, the tools described in this article may also be helpful to instructors in the process of creating their first case. All aspiring case authors are directed to Herreid (1999) for an excellent overview of the case-writing process.

A summary of the steps required to support students in the creation of case studies is provided in Table A1 (p. 62). The table lists the actions taken by the instructor and the students at each stage of the project. Highlights of key actions are described in the sections that follow. This assignment begins on the first day of class, and the final submission is due on the last day of the course.

Assigning the project

On the first day of class, I inform students about the project. Each deliverable is described in Table A2 (p. 63). Instructors can customize the information to create student instructions for this assignment. After describing the expectations and deadlines, I propose topics for the case studies. A sample list of topics for a Nutrition course is provided in Table A3 (p. 64). This list is based on my knowledge of topics that would lend themselves to case studies, either because there is controversy about the topic, because it is popular in the media, because it is the basis of myths, or simply because there is extensive and readily accessible literature on that topic. When choosing these topics I am also mindful of the basic concept that could be taught (e.g., the topic "should athletes take creatine supplements" could be used to teach basic concepts of how the cell uses ATP to power its processes). Students are not expected to limit their selection to this list; it is merely suggestive. However, any topic they choose must be approved by the instructor, who will consider the appropriateness of a topic using the guidelines suggested previously. In practice, the vast majority of students limit their selection to those proposed. I suggest roughly as many topics as there are students in my class, and I spend about 30 minutes briefly introducing each one so that students have some basis for selection. Within a week, students must choose a topic and their teammates. The instructor ensures that no two teams select the same topic. In classes with 20 students or less, I allow students to work individually or in teams of two on this assignment, but in larger classes, groups of 3–4 students are logistically preferable.

The course then proceeds using case studies as the preferred teaching method. This achieves two objectives. It delivers course content and encourages students to practice skills such as communication, team building, and critical thinking; it also serves to introduce the format of a case. Most students are unfamiliar with case studies, and it is best to use a variety of different formats (e.g., interrupted case, intimate debate, role play, jigsaw, clicker) to expose students to what's available for their design. At the end of each case, there is a 5–10-minute debrief during which I ask the class to identify elements that worked and others that impeded the effectiveness of the case, and I encourage students to keep those in mind when developing their own case study.

Research phase

Having selected a topic, the next phase is research. Students complete this part of the project individually. Students in a team may choose to research the same broad topic, or they may divide it into subtopics and assign each one to a different student in the team. For example, when researching the etiology of multiple sclerosis, students in the team may each research all the possible causes, or else they may each research one proposed cause (i.e., one student researches the evidence that multiple sclerosis has a genetic root, another the links to infectious diseases, another the nutritional causes). Instructors should provide clear guidelines about the depth of research expected, such as the number and type of sources consulted. Note that this research should include peer-reviewed articles and also a number of sources that are easily available to the public (e.g., news articles, websites, and videos). Students are warned to remain critical of the information obtained from the latter sources but are told that it may prove helpful in developing a narrative for their case. Roughly a third of the time allotted to this project is devoted to the research phase. The output for this research is an annotated bibliography and a brief research paper (described in Table A2). Instructors should return feedback on this part of the assignment as soon as possible to allow students to proceed.

Planning the case

With knowledge in hand, students plan their case study. The first step is to create a Case Outline. This document asks students to identify the take-home message of their case and to state it in one succinct sentence. Clarifying the objectives guides all case development and is crucial in determining what is relevant and tangential in the case. In discussing a case with students, instructors should often ask, "How does this help you achieve your objective of teaching X?"

Teaching, whether using a case or another format, means being able to "break things down" and identify the information that someone would need to know to understand the larger concept. For example, to understand the double-helical shape of DNA, someone would first need to learn how nucleotides link together to form a strand, about base pairing, about polarity and antiparallel strands, etc. The Case Outline therefore asks students to identify the concepts that underlie their learning objective and to write these out in the form of bullet points.

Students must also identify two possible narratives that could be used to drive the learning. Because the course is taught using cases, students intuitively understand what a "narrative" means in this context. Cases based on real events are more engaging (Herreid, Schiller, Herreid, & Wright, 2012); I therefore advise my students to use news articles or authentic artifacts as a starting point for their storyline. I also suggest inspiring themselves by cultural phenomenon (e.g., popular diets, celebrities) because their audience will have an interest in learning more about them. Students develop two possible narratives that they summarize in one paragraph each.

Having developed and submitted the Case Outline, the team meets with the instructor for approximately 30 minutes. Although it may seem onerous on the instructor's time, it is critical for ensuring the students' success. This meeting is where the structure of the case takes shape and where students receive individualized guidance on how to write their case. I begin by asking each team to tell me about the information they developed for their Case Outline. This includes giving me the "elevator pitch" on their two storylines. This gives me the opportunity to provide feedback on their overall vision. Students commonly confuse the learning objective of the case with the storyline. For example, in a case about the use of creatine as a sports supplement, the learning objective is to teach students how ATP and creatine are used to supply energy to the cell, while taking creatine supplements is actually part of the storyline (it is a practice some athletes engage in but there is nothing to teach about it—it's the narrative used to learn about energy metabolism in the cell).

From the Case Outline information and the student pitch, I can infer the most appropriate format for the case. Selecting the format for a case study is more art than science. It depends in part on the narrative arc, the learning objectives, and the preferred teaching method. Most narratives lend themselves to several formats. The analysis that allows me to make this determination is captured in Table A4 (p. 64). It is presented in the form of a dichotomous key. It could also be converted into a flowchart. The advantage of a flowchart is that it can be used as a quick visual reference during the student meeting, while the dichotomous key provides more information. An excellent description of each case format is available in Herreid (2007). Readers wishing to view examples of each one are directed to the NCCSTS case collection where they can search the cases by "Type/Method," which is what I call the case format. Instructors can recommend one or two formats and involve students in the selection process by describing their options. In my experience, the vast majority of cases lend themselves to the interrupted format and the second-most common formats are the intimate debate and the jigsaw. In the meeting, the instructor describes the format, referring to cases of a similar format that were used in class, and works with students to plan the details of the case study. This is where each case gets fleshed out. Note that some instructors may require all students to produce cases in one preferred format. Although this may limit the creativity and diversity of the cases, it will make it easier for instructors to guide students.

For an interrupted format, students need to identify a learning objective for each section of the case. Generally, these align with the bullet-point list of subtopics identified in the Case Outline. With these in mind, I tell students that each section should contain less than a page of information, followed by three to five questions. Students commonly struggle in structuring a series of guiding yet challenging questions at the end of each section and need help with this part of their case. The following formula is easy to implement and successful in guiding novices to develop effective questions. The questions are sequenced such that the first have concrete ("there is a correct response") answers. It often tests that the reader understood the information in the body of the section. Subsequent questions become progressively more speculative and open-ended and force the reader to "think like a scientist." The reader is asked to hypothesize, analyze data, predict results, and critique conclusions. The last question should guide and encourage the reader to anticipate the information of the next section. (When using this strategy, the next section of the case should begin with a possible answer to the speculative questions so that readers receive feedback on their performance.) The instructor can work with students on one section of the case, suggesting a sequence of questions as an example. Students should be reminded that the questions should aim to meet the goal of that section of the case.

Although the development of effective questions is one stumbling block, another is the lack of follow-through with the narrative of the case. Novice writers often make the mistake of starting with a strong narrative in the first part of the case but then forget about it as they focus on content in each subsequent section. Remind students to weave their story and their characters with the content throughout the case.

For intimate debate or jigsaw cases, the first consideration is to identify suitable sides of a controversy or the different perspectives on a topic (at most there should be five different perspectives). I tell students to prepare a summary of facts, evidence, or arguments in support of each position. This can be drafted in the form of prose or a bullet-point list. These documents should be equal in length for each position and at most one page. In effect, writing this section of the case is like writing a minireview paper.

The first part of the case introduces the narrative and provides context for the debate or jigsaw. It should pose the problem that is at the heart of this case: What is it that we want to solve or decide? The more difficult section to write is the last part, in which the perspectives of each side are incorporated to solve the problem. I typically challenge my students to think of a way in which the teams formed during the last stage of the case (with an expert from each perspective) can work on slightly different versions of the initial problem. For example, in a case study about the Paleo diet where students learned about the nutritional, sports physiology, ecological, and evolutionary implications of this diet and were asked whether the protagonist should adopt this diet, some teams were told the protagonist had economic constraints, others that the family suffered from a health condition, etc. (Harden, Foley, Poon, & Prud'homme-Généreux, 2014) The effect of adding this twist is that each team's report to the whole class is less repetitive, more nuanced, and more engaging.

Writing the case and obtaining feedback

Students should leave the one-on-one meeting with a clear plan for their case, and they have about a third of the time devoted to this project to write a draft. If the meeting was done well, instructors are rarely consulted during the case writing stage.

The key to helping students write wonderful cases, as in any other assignment, is to provide feedback. This is particularly important for this assignment because it is a new, unfamiliar exercise. Students are invited to submit a draft version of the work to the instructor and to receive feedback. Instructors should pay particular attention to accuracy and to the effectiveness of the discussion questions.

The next step is for students to teach their case to the class. Because students are untrained in pedagogy, it would be unfair to assess them on how well they can use a case study to teach. The purpose of having them teach their case is for them to receive feedback on the effectiveness of their case study. Did the audience find one question confusing? Did the authors assume background knowledge of the audience that was lacking? The experience of teaching their case will give authors the feedback they need to improve their case prior to its final submission. Presenters are evaluated on a Pass/Fail basis (see Evaluation section). Because students fear embarrassment in front of their peers, they are motivated to prepare for this presentation and generally perform well. After the case, the instructor facilitates a 5–10 minute class discussion to draw out the strengths and weaknesses of the case. In my experience, the audience is enthusiastic and supportive. In a large class, this step could be carried out in smaller groups (e.g., breaking a class of 100 students into smaller groups of 20–25 and assigning each one to a different classroom). This should mitigate anxieties about presenting to a large number of people.

This is the last stage of feedback. Using what they noted from using the case, they work on and submit all of the required documents for the Final Submission (see Deliverables in Table A2).

Evaluation

Each deliverable is worth 20% of the assignment grade, but with a twist (see *Note* at end of article). Many of the deliverables (the Case Outline, Draft Case, and Case Presentations) are submitted for the purpose of receiving feedback. In the past, these did not receive a grade, but students didn't apply themselves as much as for graded assignments, and many students failed to submit at all. To resolve this, each of these assignments is evaluated on a Pass/Fail basis. If the instructor determines that students made efforts to complete the assignment diligently, then the assignment receives a "Pass." The numerical value of this "Pass" is identical to the value of the Final Submission. If students receive a "Fail" for that part of the assignment, they lose 20% of their grade on the final project. As a result, students have an incentive to complete all of the work conscientiously, but they aren't given spurious grades for simply submitting work. In reality, the grading scheme is such that the Summary Report is worth 20% of the grade and the Final Submission is worth 80% (as long as all the intermediate steps are completed diligently).

Except for the Summary Report, all deliverables are completed as a team. It is therefore important to put in place strategies for recognizing the contributions of each member and for adjusting the grade based on those contributions. The recommended strategy is a peer evaluation as described by Herreid (2001). An evaluation rubric used to assess the Final Submission is provided in Table A5 (p. 65).

Most cases are impressive in their creativity, but the academic rigor exhibited in the submitted work varies widely and reflects the depth of analysis and understanding of the students in each group. This is not unlike the variability found in other assignments such as research essays. Even the most rigorously researched and written cases need to be revised to improve their depth prior to use in another course or submission to NCCSTS. The narrative typically requires little improvement.

Reflections

The cone of learning, recently tested and confirmed (Lord, 2007), shows that the best method of learning something is to teach it. Through this assignment, students first dissect a topic as they consider how best to achieve a learning goal and then they use the materials they created to teach other students. The information learned through this activity is therefore expected to be retained effectively.

When queried about the depth of research required to carry out this project, students report that it is equivalent to what they do to write a research paper (Prud'homme-Généreux, 2013). I prefer this assignment for several reasons: It unleashes the students' creativity, it allows students to share what they learned

with their peers, and it helps me build a tool kit of teaching materials to use in future courses. This latter prospect is a motivator for many students; they like that their work may find a useful purpose. In addition, several of my undergraduates' cases are now part of the NCCSTS case collection, expanding their use to other classrooms beyond the walls of our institution. ■

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References

Harden, H. K. L., Foley M. L., Poon R. A., & Prud'homme-Généreux, A. (2014). *The modern caveman's dilemma: Who should eat the paleo diet?* Buffalo, NY: The National Center for Case Study Teaching in Science, University at Buffalo. Retrieved from http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=752&id=752

Herreid, C. F. (1999). Cooking with Betty Crocker: A recipe for case writing. *Journal of College Science Teaching, 29,* 156–158.

Herreid, C. F. (2001). When justice peeks: Evaluating students in case study teaching. *Journal of College Science Teaching, 30,* 430–433.

Herreid, C. F. (Ed.). (2007). *Start with a story: The case study method of teaching college science*. Arlington, VA: NSTA Press.

Herreid, C. F., Schiller, N. A., Herreid, K. Y., Wright, C. (2012). My favorite case and what makes it so. *Journal of College Science Teaching, 42*(2), 70–75.

Lord, T. (2007). Revisiting the cone of learning: Is it a reliable way to link instruction method with knowledge recall? *Journal of College Science Teaching, 37*(2), 14–17.

Prud'homme-Généreux, A. (2013). Involving freshmen nonscience majors in case writing: Lessons learned. *Journal of College Science Teaching, 42*(6), 58–64.

Annie Prud'homme-Généreux (apg@questu.ca) *is Founding Professor in Life Sciences at Quest University Canada in Squamish, British Columbia, Canada.*

TABLE A1

Step-by-step guide to helping students write their case study. As most students are unfamiliar with the case study format, they must be carefully guided through the assignment. The steps outlined below ensure that by the time students write their draft case, they are confident about the format and have received sufficient individual guidance to focus on the specifics of their case.

Step	Instructor action	Student action
Introduce project	• Provide rationale for using case studies to learn in the classroom • Provide goals and rationale for the case-writing assignment • Provide assignment overview, deliverables, deadlines, evaluation rubric • Provide list of suggested topics	
Experience case studies	• Teach the course using case studies. Ensure different formats are used (e.g., interrupted, intimate debate, jigsaw) • At the end of each case, guide students to reflect on elements of the case that made it effective and how it could be improved	• Participate in the cases, learn content, compare the different case formats • Recognize elements of an effective case and mistakes to avoid in creating one
Form teams	• Ensure each team is pursuing a different topic and also a suitable topic (for the course and also one that lends itself to a case study)	• Form teams • Pick topic and inform instructor • Divide background research
Research topic	• Grade Summary Report and provide feedback	• Individually research one topic • Produce Summary Report
Case study outline		• Read each team member's Summary Report • Discuss and then write the Case Outline
One-on-one meetings	• Read Case Outlines • Meet with each team for 30 minutes • Identify suitable case format (see Table A4) • Describe the case format to team, brainstorm and outline the specific case study (e.g., what goes into each section), and identify potential pitfalls • Note whether entire team comes prepared for the meeting with a detailed and well-developed Outline (this will factor into the assessment)	• Do an "elevator pitch" for two alternative "stories" for the proposed case
Draft case study	• Provide feedback on case study	• Submit draft of case study (visuals included, but Teaching Notes and Answer Key not required) • Make revisions based on feedback • Describe where and how case changed in Feedback Response
Teach case study	• Direct classroom discussion on the effectiveness of the case (this is feedback for the case's authors)	• Teach a class using case study • Observe student response to the case (note errors or glitches in case)
Final case submission	• Assess work using Evaluation Rubric	• Use classroom feedback to revise case study • Describe where case changed (and reasons for change) in Feedback Response • Write Answer Key • Write Skeleton Teaching Notes • Submit Final Case Study, Answer Key, Skeleton Teaching Notes, Feedback Response
Use and share outstanding cases (optional)	• Identify cases that are outstanding, obtain student permission to use and revise to improve the academic rigor, use in future courses, and consider submitting to the NCCSTS case collection	

TABLE A2

Deliverables. There are five deliverables for this project: the Summary Report, the Case Outline, the Draft Case, the Presentation of the Case, and the Final Submission (which includes the Final Case, Answer Key, Skeleton Teaching Notes, and the Feedback Response). The information below provides details on each deliverable. Instructors may use this information to create customized instructions for their students.

Summary Report
Individual Assignment
20% of assignment grade

Each student researches one topic. Students are expected to engage in substantial research, which instructors can define in ways that are appropriate for their course (e.g., include a minimum of 10 peer-reviewed papers and 5 websites). The research should be done using a variety of sources, including but not limited to academic sources. The output consists of two parts: an Annotated Bibliography and a Research Summary.

Annotated Bibliography
Each of the works consulted is appropriately cited and followed by a brief description of the resource. The description should be 1–2 paragraphs in length. The text should emphasize possible connections and uses in the case study.

Research Summary
A two-page (single-spaced) research paper that summarizes what was learned. This requires students to go one step beyond the Annotated Bibliography to organize the knowledge and distill a thesis.

Case Outline
Team Assignment
Submitted before the one-on-one meeting
20% of assignment grade (This assignment is evaluated on a Pass/Fail basis, and a Pass means that the grade on this assignment is the same as the Final Submission)

One document per team
- Identify the core concept you want to teach (1 sentence)
- Define 5 concepts needed to understand the core concept (bullet points)
- Outline 2 potential narratives (1 paragraph each)
- Identify top 10 resources with 1–2 sentence description for each

Draft Case
Team Assignment
Submitted for feedback
20% of assignment grade (This assignment is evaluated on a Pass/Fail basis, and a Pass means that the grade on this assignment is the same as the Final Submission)

While this is called a "draft" case study, it should be treated as final a product as students can develop without feedback. It should include all the required elements, such as questions, figures, and references. It should be good enough to use in teaching. The purpose of this draft is for the instructor to use her teaching expertise to provide feedback on the case, its structure, accuracy, effectiveness of the questions, and narrative structure.

Presentation of the Case
Team Assignment
20% of assignment grade (This assignment is evaluated on a Pass/Fail basis, and a Pass means that the grade on this assignment is the same as the Final Submission)

Each team has one hour to teach its case to the class. The purpose of this exercise is not to demonstrate teaching skills but rather to obtain feedback on the case. Each member should contribute equally to this step. In large classes, instructors may break up students into smaller groups or ask students to produce shorter cases and prepare a 30-minute presentation.

Final Submission
Team Assignment
Group grade, which can be adjusted for each student based on peer evaluation
20% of assignment grade

This final submission consists of four documents: the Final Case, its Answer Key, the Skeleton Teaching Notes, and the Feedback Response.

Final Case Study
The case study consists of the pedagogical material that is distributed to the class. It may consist of handouts or a slide-show presentation. This material should be sufficient to lead a one-hour class. All information should be referenced. Where possible, students should create their own graphics, producing them from scratch or adapting existing figures for the purpose of the case.

Answer Key
The Answer Key provides a comprehensive response to each of the questions posed in the case. "Comprehensive" means that the answers are written in complete sentences, and it also means that it includes background information helpful to an instructor in leading class discussion when this question is discussed. Note that certain types of case, such as Intimate Debate, do not have questions to answer. However, the authors may present a structured list of arguments or issues that are likely to be raised by each side of the debate.

Skeleton Teaching Notes
This document is composed of two sections. The first contains the learning objectives of the case. For interrupted cases, students should write one overarching learning objective along with one for each section of the case. The second section is classroom management which is a step-by-step guide to using this case in a class. It can include information such as how much time to devote to each section, what the audience found most challenging, etc.

Feedback Response
Students note where they used feedback (from the instructor or from the class) to improve their case. This Report should include a brief rationale for each change that was made. This requirement was added after observations that students were not using the extensive feedback that they were given throughout this assignment.

TABLE A3

List of topics for nutrition cases. This abbreviated list illustrates the type of ideas that are proposed to students for their case study. It was suggested to sophomore nonmajor Nutrition students.

- What causes obesity? Is it due to overeating and inactivity? The composition of the gut microbiome? The composition of the diet? Genetic predisposition? Epigenetic modifications? An infectious plague brought about by a virus? Time of day when food is consumed? Something else?
- Increasingly, people claim to be gluten sensitive (non-celiac gluten sensitivity). Is there any evidence for the existence of gluten sensitivity? What is likely causing the rise in diagnosis?
- Which is better for your health: a plant-based diet which is high in complex carbs or a low carbohydrate diet (e.g., Atkins diet)?
- Is it a good idea to take a multivitamin supplement every day as "insurance" to ward away the risk of deficiencies and chronic diseases?
- Is high fructose corn syrup more detrimental to health than an equivalent quantity of table sugar?
- Are the daily recommended doses of vitamin D adequate?

TABLE A4

Case format selection guide (a dichotomous key). Below is a proposed guide to select the format for a case. It is structured as a dichotomous key. Yes/no answers to each question about the intended use, goals, and narrative structure of the case guide a user through some of the most common formats. Instructors may convert this key into a flowchart which will contain less information but may be easier to use as a reference when meeting with students.

1. Is the storyline centered on two (and only two) "sides" that oppose one another in some way (e.g., two distinct hypotheses, two interpretations), that each have their merit, and for which there is not a clear-cut choice?
a. If YES then consider an **INTIMATE DEBATE**.
b. If NO, go to 2.

2. Does the narrative arc revolve around a comparison of several (more than two) different points of views or hypotheses, each with its own set of rationale or supporting hypotheses?
a. If YES, go to 3.
b. If NO, go to 4.

3. Can the separate points of views or hypotheses be captured or represented by different people (and would students benefit from putting themselves in the shoes of these people)?
a. If YES, then consider a **ROLE PLAY**.
b. If NO, then consider a **JIG SAW**.

4. Is the primary purpose of your case study to discuss or explore the context or implications of a particular science topic (for which there is not necessarily a right answer) rather than focus on the science topic itself (for example, exploring the ethical landscape of *in vitro* fertilization rather than understanding the techniques of IVF)?
a. If YES, then consider a **DISCUSSION**.
b. If NO, go to 5.

5. Are students expected to engage in a significant amount of research (possibly outside of class) to find information relevant to solving the case (rather than be provided all necessary information as part of the case)?
a. If YES, then consider **PROBLEM-BASED LEARNING (PBL)**.
b. If NO, go to 6.

6. Is the goal for students to examine how one (or a series of closely related) discovery was made?
a. If YES, then consider a **JOURNAL CASE**.
b. If NO, to go 7.

7. Do you plan to provide the information for the story in a lecture?
a. If YES, then **CLICKER**.
b. If NO, then **INTERRUPTED**.

TABLE A5

Evaluation rubric for the Final Submission. The rubric used to assess the Final Submission describes the characteristics of expert-level performance (which would receive a full grade) and novice performance (which would be awarded a passing grade). Grades lower than the passing grade are possible if the novice criteria are not met. This rubric determines the group grade, but this may be adjusted for each individual based on peer assessment.

Element	**Max Points**	**Novice** (minimum requirement to obtain a passing grade)	**Expert** (description of criteria for a complete grade)
Goals and organization	2	There may be tangential sections of the case but overall the main learning objective is kept in focus. While there is a coherent theme uniting every section, the connection between sections may need work. For example, a section designed to ensure that learners have appropriate background knowledge may not refer to the case's narrative.	The case targets a clear learning objective and each section of the case serves to meet that goal. The information flows from one section of the case to the next and there is a coherent storyline throughout the case. Each section builds on and depends on information learned in the previous section. There is no repetition; rather, the reader's understanding deepens at each step.
Clarity of writing	2	Some grammatical and spelling mistakes may occur, but the authors' intent is communicated and the reader understands the text.	The text is free of grammatical and spelling mistakes. Technical words are defined and used appropriately. Writing is concise and does not repeat the same information twice.
Engaging narrative	1	The storyline presents a problem or dilemma that will be of interest to a subset of the student population (e.g., a case that will only interest athletes). While the case may not be based on real events, it is presented as a plausible story.	The storyline elicits curiosity and the desire to explore the topic in more depth. The story is based on real events. The case integrates authentic artifacts such as clips from news articles to emphasize the relevance of the case. Stylistic choices, such as use of first person narrative or dialogues increase interest in the case.
Academic rigor	6	The information presented in the case is accurate (bearing minor mistakes that do not affect the case's learning goal). The case demonstrates that the authors are knowledgeable of the topic, in the research literature as well as of the type of information that is available to the general public.	The information presented in the case is accurate. The case demonstrates that the authors are knowledgeable of the topic. The authors demonstrate that they critically evaluated the evidence presented. The case shows the authors' ability to understand the context and implications of the research topic.
Effectiveness of the questions	3	The questions serve mostly as a means of testing that students understood the information provided in the case. Answers can be found directly in the case study (i.e., they do not require readers to generate new information or think critically). The questions stand alone and do not anticipate the next section of the case study or build on one another.	Questions included at the end of each section of the case elicit deeper thinking and force readers to anticipate the next step and to "think like a scientist." The questions are challenging, yet doable inasmuch as readers have sufficient information to answer them. The questions force readers to think deeply and are not simply recall questions. For particularly difficult concepts, the questions are sequenced and build upon one another to guide readers to the desired outcome.
Completeness of assignment	5	All supporting materials are included (Answer Key, Skeleton Teaching Notes, Feedback Response). Most of the information mentioned in the case study is cited, though there are a few minor omissions. Where appropriate, visuals improve the case study. The visuals are obtained from other sources and no effort was made to adapt them for the purpose of this case (e.g., the visuals were not simplified to focus on the goals of the case). The Answer Key provides rudimentary but correct answers to each question. The Teaching Notes provide basic information about the sequence of steps and time allotted for each section of the case.	All information is rigorously cited in the case. Where possible, the authors produced original figures for the case. When existing visuals are included, they are appropriately attributed. All supporting materials are included (Answer Key, Skeleton Teaching Notes, Feedback Response). These documents are thoroughly and diligently written. For example, the Answer Key not only contains the correct answers, but also provides supporting graphical explanations and background information that might help an instructor lead a class discussion with confidence. The Teaching Notes contain information not only about how to conduct the case in a classroom, but also notes where readers encountered difficulties and how to mitigate each challenge.
Responsiveness to feedback	1	The case was modified between its draft and its final version to address the biggest criticisms or pitfalls. The Feedback Response document highlights where the changes were made, but provides no rationale explaining the choices that were made.	There is a significant improvement between the draft version of the case and the final submission. The Feedback Response document is comprehensive in identifying how the case was changed in response to which feedback, and explains the reasoning behind each decision to modify the case.