

# Student Reviews of Scientific Literature: Opportunities to Improve Students' Scientific Literacy and Writing Skills

*Susan J. Karcher*

Department of Biological Sciences  
Purdue University  
West Lafayette, IN 47907-1392  
[suek@bilbo.bio.purdue.edu](mailto:suek@bilbo.bio.purdue.edu)  
765-494-8083

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## Abstract

As biology educators, we seek to improve students' abilities to read scientific articles and evaluate them critically. Frequently, we also strive to improve students' writing skills.

This mini workshop presented what has worked in a large sophomore-level laboratory in genetics and molecular biology class of 200 biology majors. At Purdue, we have had students summarize recent scientific journal articles related to their course. Students first emailed citations of recent articles to the course instructor to get approval of the articles to be summarized. Students wrote brief--one to two paragraphs--summaries of the articles. The summaries were evaluated by the instructor; students had an opportunity to re-work their summaries. The summaries were then posted on the course web site for all students to read. Students had two opportunities to do such summaries during the semester.

In the mini workshop, participants evaluated three different student summaries of the same article. In addition, the participants discussed what had worked for them.

## Overview

As part of a biology class, students will critique a published research article. To assign this critique to students, how does the instructor begin? The references cited at the end of this article note a number of different approaches. Specifically, Kuyper (1991; p. 249) provides a

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twenty-item long checklist for critiquing a research article. Nussbaum (1991) gives suggestions on making library assignments. Chinn and Hilgers (2000) summarize ways to use writing to promote learning. They talk about the instructor as corrector; the instructor as journal editor; and the instructor as collaborating scientist. They note that those who help student writing the most helped students go beyond content mastery by expecting students to speak and write frequently; by providing and discussing detailed writing and assessment guidelines; and by giving peer and instructor feed-back on assignments. Also see the examples of suggestions for students in the Postlethwait online reference.

An instructor might give students a guideline to help them think critically. See the list below.

### **Principles of Critical Thinking**

1. Gather complete information.
2. Understand and define all terms.
3. Question the methods used to derive facts.
4. Question the conclusions.
5. Look for hidden assumptions and biases.
6. Question the source of facts.
7. Don't expect all the answers.
8. Examine the big picture.
9. Examine multiple causes and effects.

This list is patterned after that in Chiras (1992; Table 1, p. 465).

### **An Example Used in a Large Laboratory Course**

I have students summarize articles for extra credit. My students are biology majors, college sophomores, taking a genetics and molecular biology laboratory course. The journal summaries are 10 points out of a total of 450 points for the whole course. I don't give the students many guidelines, just the following (this was used in Spring 2000):

#### **Timetable for Extra Credit Journal Summaries**

Journal Summaries must be submitted by the end of the week indicated for students in those sections. The students receive a schedule of when the summaries are due.

For Extra Credit (Up to 5 pts per acceptable journal article summary; 2 summaries may be submitted for up to 10 pts extra credit.)

1. Email Dr. Karcher to get approval of the article you wish to summarize. Articles must be current –late 1999 or 2000!—and related to our course.
2. By the end of the week indicated for your section, email a 1 to 2 paragraph summary of the article. Turn in a photocopy of the article to Dr. Karcher's office by the end of the week indicated.
3. Dr. Karcher will check your summary and suggest modifications, if necessary. The summary will then be posted on our Bio 242 Web site.
4. There will be an extra credit question on each exam and (sometimes on quizzes) pertaining to the extra credit summaries. One should be able to answer the question on the exam or quiz by reading the summaries rather than the entire paper.

## Mini Workshops

5. At the end of the term, summaries that are especially noteworthy may be submitted to the Journal Watch section of *Bios*, the publication of the Beta Beta Beta National Biology Honor Society [(ISSN 005-3155) P.O. Box 428 Ocean Grove, NJ 07756.]

We have noted a number of positive points for having students write summaries as well as some problems.

### **Advantages:**

1. The students develop more interest in what is going on in research. They have a sense of "ownership" about the topic because they have written about it.
2. The students learn about new areas that would be harder to bring into the conventional laboratory course format. For example, for the spring 2000 course, students doing summaries pointed out interesting new papers that brought out the fact that the *Drosophila* genome had just been sequenced and the usefulness of karyotyping dog chromosomes.

### **Problems:**

1. Communication with students: Sometimes there is still confusion about: what is a complete citation; what is a journal article—not a magazine article; that the article must be current—1999 or 2000; that the article be a research article not a review.
2. Sometimes the students do not make clear the relation between the article chosen and the course content.
3. Significance of article—see the forest or see the trees? Students may write in detail about some aspects of the articles, yet miss the overall significance of the works.
4. In a large course, this is very time consuming for the instructor, but students do benefit.

### **Solutions or Things to Try Next:**

1. Give the students a form to submit with their summaries and articles to assure they have followed all the steps.
2. Give the students more guidelines on "how to write" a summary paragraph. Give the students several examples from previous years. Include examples of "good" and "poor" quality summaries.
3. Narrow the range of topics the students may choose.
4. Ask the students to include a second paragraph explaining the relation between the article chosen to summarize and the course material.
5. Ask the students to write several questions about their summaries.
6. Students might evaluate or critique each other's summaries. This would reduce the time the instructor spends reading the summaries and give the students a chance to develop their editing skills.
7. If giving a few specific articles for students to summarize, pair primary literature research papers with short accounts of the significance of the research from a secondary source, for example, the News and Views section of *Science* or *Nature*. This lets students see examples of commentary on the significance of research articles.

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## Online Articles

- <http://www.the-scientist.com/> (for news about articles in journals)  
<http://www.nature.com/nature/>  
<http://www.sciencemag.org/>

## Online Aids from Courses

- <http://www.wsiu.org/tv/ml/seven.html> (scientific literacy)  
<http://jchemed.chem.wisc.edu/Journal/issues/1996/aug/abs753.html>  
 Alfred B. Ordman (Beloit College, Beloit, WI) teaches a course on Scientific Literature and Literacy: A Course of Practical Skills for Undergraduate Science Majors.  
[http://biology.uoregon.edu/Biology\\_WWW/Online\\_Classes/BI410s97/default.html](http://biology.uoregon.edu/Biology_WWW/Online_Classes/BI410s97/default.html)  
 John H. Postlethwait, University of Oregon presents some hints about genomics journal club preparation.

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