

## Simple Method for Using Primary Literature in a Large Microbiology Course

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### How it works:

- I select a primary literature article relevant to the topics recently covered in class.  
Articles are usually from Appl. Environ. Microbiol. or PNAS.
- I post the article and set up student discussion groups in Blackboard – 12 students per group.
- Students read the article and participate in the discussion prior to the lecture exam.
- Students answer one short answer question on the exam about the article.
- Students can earn up to 5 points for their participation in the discussion.
- The exam question is worth 4 points.

The entire course (both lecture & lab) is based on 600 points.

Each article represents 9 points or 1.5% of their course grade.

All together the four articles represent 6% of their course grade.

### What I like about this method:

- Gets my students reading the literature!
- Allows me to make microbiology more relevant and interesting to them.
- Allows stronger students to help the weaker students in the discussions.
- Gives my students multiple opportunities to improve their literature reading skills.
- Grading effort on my part is minimized.

### What are the drawbacks of this method:

- Students can become overwhelmed and frustrated when trying to comprehend the article.
- Discussions can get side tracked or often don't focus on the data of the article.
- Students wait until a day or two before the exam to discuss the article.

### What my students (n=148) report about this method when surveyed:

I enjoyed reading the articles. 34% agreed (A) or strongly agreed (SA)

30% disagreed (D) or strongly disagreed (SD)

Reading the journal articles was challenging for me. 69% A or SA; 10% D or SD

Reading the articles gave me a broader perspective of microbiology. 80% A or SA

I enjoyed reading about current, real research in microbiology. 72% A or SA

It was easy to see how the articles related to topics we covered in lecture. 75% A or SA

I found the Blackboard discussions to be a worthwhile activity. 41% A or SA; 35% D or SD

The discussions helped me understand the articles better. 59% A or SA; 24% D or SD

Having a question on the exam motivated me to try & understand the article. 77% A or SA

### Student quotes:

“I liked the articles, made me think! Discussions let me understand better by helping answer others questions.”

“It really helped open up a wide range of thought. I changed the way I ate after reading the one on gut microbiota.”

“It was interesting to see how the things we learned in class could be used in the real world.”

“To understand you really had to focus and put pieces together so overall it helped to better learn the material.”

“It would have been interesting to discuss the articles in class after the exam to review any topics that were still confusing.”

## Sample article titles, citations, and exam questions.

Title: Internalization of *Salmonella enterica* in leaves is induced by light and involves chemotaxis and penetration through open stomata. Citation: AEM (2009) 75:6076

Exam question: Projected on the screen is part of a figure from the *Salmonella* in lettuce article. What are the red spots? What are the green spots? What does it mean when both red and green spots can be seen in the same slice of lettuce tissue (like in this picture)?

Title: Microbiological analysis of food contact surfaces in child care centers.

Citation: AEM (2008) 74:6918

Exam question: In the child care center article, the researchers made numerous conclusions based on their data. List TWO general conclusions from the article about levels of bacteria at the child care centers.

Title: Leaf age as a risk factor in contamination of lettuce with *Escherichia coli* O157:H7 and *Salmonella enterica*. Citation: AEM (2008) 74:2298

Exam question: Here is a figure from the article you read. Describe the particular experiment that the researchers were doing to collect these data. Also describe the major conclusions that can be made from this figure. (If you look up the article, I used figure 7.)

Title: Impact of diet in shaping gut microbiota revealed by a comparative study in children from Europe and rural Africa. Citation: PNAS (2010) 107:14691

Exam question: In the article you read, the authors place a great deal of importance on the circled subcluster in the figure below. According to the authors, the subcluster indicates that \_\_\_\_\_ plays a major role in shaping the composition of the gut microbial community. **What word** goes in the blank above and **explain WHY** the subcluster demonstrates that this factor is so important in shaping the gut microbial community.

Title: Opportunistic pathogens enriched in showerhead biofilms. Citation: PNAS (2009) 106:16393

Exam question: In the showerhead biofilms article, describe HOW (in a sentence or two) the researchers determined which bacteria were in the showerheads. Also briefly state ONE major finding from their research.

Title: Chimpanzees as an animal model for human norovirus infection and vaccine development.

Citation: PNAS (2011) 108:325

Exam question: In the article you read, the researchers infected chimpanzees with noroviruses. Other than observed clinical symptoms (vomiting, diarrhea, etc.), **explain** two ways that the researchers demonstrated that the chimps were successfully infected – and the virus really was present in the chimps.

Title: Phage therapy to reduce preprocessing *Salmonella* infections in market-weight swine

Citation: AEM (2010) 76:48

Exam question: Explain what phage therapy is (in a sentence or two).

Looking at the figure below, was phage therapy more effective than the control treatment?

Do not just say Yes or NO - EXPLAIN your choice.